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FLIGHT

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Passport to Hypersonics

THIS week we are able to lift the curtain on the Bristol 188. Except for the X-15, which must be carried into the air by a parent B-52, this is the fastest aeroplane in the Western world. Although not intended to earn revenue or defend its native land, it may transcend in importance everything previously constructed in this country. Without it we should never be more than a second-class power aeronautically; with it we may acquire a passport to the hypersonic era. Whatever one's views on manned military aircraft, we must all accept the inevitability of faster aeroplanes. The 2,000 m.p.h. airliner will surely come and the 188 is a prerequisite. With good direction and reasonable luck it should produce invaluable information for a relatively modest outlay.

In the absence of precise information on Russian progress the only other nation likely to continue deeper into the high-Mach realm is America. Many manufacturers there have expressed interest in supersonic airliners, but only North American are likely to acquire first-hand experience with really worthwhile vehicles. Already the X-15s are bringing back data from beyond the boundaries of previous experience, and in 1963 the two XB-70As will take to the air. These giant canard deltas were designed to succeed the B-52 bomber; but it is a momentous sign of the times that the programme now appears to be aimed solely at research. Britain could not afford a XB-70 counterpart; so we cannot afford not to wring the last shred of knowledge out of our Bristol 188—and to put it to use.

Logistic Co-operation

WHEN Exercise "Red Banner" was held on Salisbury Plain in October a young R.A.F. senior officer, A. Cdre. P. G. Wykeham, was a keen observer. Now he has been appointed to command No. 38 Group, which is being formed early next year to control all tactical transport operations; and as A.O.C.-designate he attended last week's air support exercise "Winged Coachman." To his new post he brings a distinguished Service record, youthful drive (at 44 one of the youngest-ever peacetime air vice-marshals) and an analytical mind, as those who heard his brilliant summary of Exercise "Carte Blanche" will testify.

Some of the problems the new A.O.C. will face were touched on in the Army League's recent admirable booklet, *The British Army in the Nuclear Age*. This was written before the formation of No. 38 Group was announced, and certain conclusions need re-applying. It speaks of the Army being "woefully short" of helicopters; and this shortage now applies to the new formation, which is to control the Whirlwinds formerly operated by the Joint Experimental Helicopter Unit. The booklet says that the development of VTOL aircraft should proceed urgently; that a reserve of aircraft and forces might be stationed in Kenya; and that, although the Royal Navy and R.A.F. are primarily responsible for equipment for supplying and transporting military forces, a case could be made "for giving the Army more latitude in control over its own support logistics."

This is a point which will need careful working-out at No. 38 Group, whose staff is to include Army representatives. Put simply, it implies that if the Army is to be transported and supplied it should have a reasonable say in how this is organized. Looked at in the context of No. 38 Group, the implication is that the R.A.F. should not adopt a dictatorial attitude over the aircraft it controls.

When the next big air support exercise is held, in North Africa early in 1960, the new Group will have a chance of showing how these problems can be solved.

FROM ALL QUARTERS

TOUGH TENDERFOOT: About to fly is the sturdy Canadair CL-41 basic trainer. Powered by a single Pratt & Whitney J60 (JT12) turbojet of 3,000 lb thrust, the CL-41 promises to be an exceptionally attractive machine, but has yet to receive a production contract

No. 1 Merger?

IF the Hawker Siddeley Group takeover bid for the Blackburn Group is accepted, the resulting merger will bring into being the first of the large groups into which the Government is anxious for the aircraft industry to be re-organized. Similar integrations, in the opinion of some observers, may ultimately centre on the English Electric and Vickers groups, where aviation activities likewise form only a part of vast industrial enterprises.

The Hawker Siddeley offer, announced on Thursday last week and to be put "as soon as possible" to Blackburn shareholders, is for the whole of Blackburn's issued capital of £1,373,218 in 10s Ordinary shares. Hawker is to offer one of its £1 Ordinary shares for each Blackburn share, and Blackburn shareholders are also to be paid a special capital dividend of 1s a share out of the profits on a recent property sale.

Blackburn Aircraft Ltd., which is now building NA.39s for the Royal Navy, is the leading company in a group whose activities include Jowett Engineering and Universal Flying Services. The chairman, Mr. Eric Turner, recently announced (*Flight*, November 6) that he would be resigning at the end of this year to become deputy chairman and chief executive of B.S.A. Ltd., but would remain on the board of the Blackburn Group, whose assets were put this year at just over £6m.

The Hawker Siddeley Group, which in September took over Folland Aircraft Ltd., has assets stated last January to be £200m. Its interests (both in the U.K. and Canada) range from aircraft and guided weapons to many branches of heavier engineering, including nuclear power.

Royal Blind Landings . . .

VISITING R.A.E. Bedford last Friday, the Duke of Edinburgh experienced three automatic landings at Thurleigh airfield, sitting in the co-pilot's seat of a Canberra. Neither he nor the captain of the aircraft, F/L. A. J. Camp, touched the controls during the landings, which were made with a 15-20 m.p.h. crosswind.

Before his half-hour flight, Prince Philip was briefed on the system (which the Blind Landing Experimental Unit is developing) by the unit's Superintendent, Mr. W. J. Charnley; and after his flight he took part in a discussion on the system.

Prof. M. J. Lighthill, Director of R.A.E. Farnborough, said later: "The Duke seemed very impressed with the system and had his own views on its development. He seemed to think we ought to press on to get the equipment working in civil aircraft, and he mentioned specifically the Viscount."

. . . and Helicopter Experience

CROWN PRINCE MUHAMMAD of Jordan has completed a course of helicopter instruction under Lt-Cdr. Roy S. Bradley, Westland's assistant chief test pilot, who used King Hussein's private Widgeon for the purpose. The Crown Prince was taken up to solo standard, but was not actually allowed to fly solo; remarkably enough, he had received no previous flying training of any kind.

During his eight weeks in Amman Bradley was also able to give King Hussein advanced helicopter training, including engine-out landings. During this period the Shah of Persia visited Jordan and the King flew him in the Widgeon from Maan to Petra, 50 miles away—the first time, it is believed, any mechanical vehicle has entered the "rose-red city."

Last February, while taking part in search-and-rescue operations for a crashed Air Jordan aircraft, King Hussein personally rescued survivors and flew them back to hospital in the Widgeon; and later in the year he participated in flood rescue work, bringing out nine people in one flight—a record for the five-seat Widgeon, made possible by removing the passenger seats.

On leaving Amman, Roy Bradley went on to Teheran for two weeks to do test and demonstration flying in two Whirlwinds put at his disposal by the Shah of Persia.

Anglo-German Weapons

LAST week the Defence Ministers of Britain and Germany held discussions with a view to achieving closer integration of arms. No detailed agenda has been published, but a communique was issued at the conclusion of the talks and both Ministers spoke to the Press.

Of the greatest immediate interest is the surprising announcement that Britain may adopt a VTOL fighter being developed in Germany. According to Mr. Watkinson, "two British firms are already competing against each other in this field" (presumably one is the Hawker P.1127, and the other may be a Short design); yet when asked if the German project was entering the field in competition and whether it might be adopted by this country, he replied: "That is what we've got to face. If we bought the German VTO aircraft there is no reason why it shouldn't be built in this country as well as in Germany." There is already the possibility that the British Army may adopt the Dornier 27 STOL aircraft.

In the engine field, Herr Strauss welcomed increased co-operation, particularly regarding engines for manned aircraft—and the Rolls-Royce/M.A.N. agreement (*Flight*, October 30) was specifically mentioned in this context.

As a result of their discussions the two nations have agreed to recommend to NATO that Blue Water, the corps-support bombardment missile under development by English Electric Aviation, should be adopted as a standard weapon. Should this recommendation be favourably received, Britain and Germany would co-operate in the continued development and production of the missile (at present Blue Water does not come within the restricted list of armaments which may be manufactured in Western Germany; neither does its nuclear warhead). A further measure of agreement has been reached in the field of anti-tank weapons, and Mr. Watkinson is reported as saying that he wanted "the Germans to lead with anti-tank missiles, on which they have some very interesting ideas." At the same time he hoped that the German Navy would buy the Short Seacat.

More Noise in the House

JET noise in the London Airport area and residents' complaints to their M.P.s were once again the subject of debate in the House of Commons last week. At the Dispatch Box for the first time to answer some pertinent questions put by Members on behalf of their constituents was Mr. Geoffrey Rippon, the new Parliamentary Secretary to the Ministry of Aviation.

The "chief offender," suggested Mr. A. E. Hunter (Lab., Feltham) was the Boeing 707. Could Mr. Rippon say whether Pan American always conformed to the regulations? Had the Minister made any representations to the airline? Mr. Arthur Skeffington (Lab., Hayes and Harlington) said that he and his constituents were satisfied that the published conditions were not being observed. It seemed clear to him that the official statement that jets would not operate unless they were not noisier than comparable piston-engined aircraft "either is not true or the Minister is using some basis of comparison unknown to us . . ." On November 7 [1958], Mr. Skeffington continued, *Flight* published a summary of noise-levels for the Boeing and Comet and comparable piston-engined aircraft based on New York data; when translated into "noys," the jets appeared to be 2½ times noisier. "If one looks at the figure which appeared in the August 14 issue of *Flight*, this seems to be the case. . . . Does the Minister still say that these are the conditions under which jet aircraft operate?"

Mr. Rippon, after outlining the main lines of attack on noise (reducing it at source, working out operational procedures, mitigating ground noises), said he was "satisfied that as a result of silencing at source and the handling procedures agreed with the airlines, the Boeing 707 is making no more noise in flight over substantially built-up areas than the large piston-engined aircraft." To Mr. Hunter's suggestion that, on the basis of a *Flight* article, "the noise of the Boeing 707 passing over areas near to London Airport is four times louder than the limit imposed in New York," Mr. Rippon said "that is just not true. The Boeing produces the same volume of noise in New York as it does in London."

What are the facts? Overall sound-pressure levels of 117 db to 120 db have been recorded while 707s have passed over Stanwell Moor Village. A figure of 117 db corresponds to a "subjective perceived noise" level of 132 PNdb (source: Bolt, Beranek and Newman Inc.), *which is equivalent in terms of noys* (see *Flight*, August 14) *to 590N*. However, a noise-level of 112 PNdb (150N) is the "never exceed" figure enforced by New York. Thus the London - New York ratio is 590 : 150, which is almost four to one. Mr. Rippon was evidently not on firm ground when he said of Mr. Hunter's remark that it was "just not true."

The E.T.P.S. Year

GRADUATES of No. 18 Course at the Empire Test Pilots' School celebrated their success on Thursday of last week at the annual McKenna Dinner, which had its usual coterie of distinguished guests, headed this year by Sir Frederick Handley Page. The commandant, G/C. R. E. Burns (wearing the traditional "titfer"), described 1959 as "a vintage year": five students had gained distinguished passes; there were no failures or suspensions; and at last, "after many years," the McKenna Trophy had gone to a member of the R.A.F. Good test pilots, said the commandant, are born, not made; but all responded to some form of training. He hoped that in their new posts the students of No. 18 course would not be afraid to say so if they thought an aircraft was a bad one. As to the future of the E.T.P.S. itself, the latest of many working-parties on the subject has said that the school must continue "as far as can be seen in the foreseeable future." But what will happen after, say, 1965 is anybody's guess.

Sir Frederick, who presented the McKenna Trophy to S/L. H. R. Radford and the Edwards Award to F/L. J. M. Henderson, spiced the occasion with a few well-chosen off-the-cuff remarks in which words like "Herald" and "laminar flow" seemed to crop up quite fortuitously. He said that one of the best things he had heard during the evening was that the school was going on. He had a crack at politicians for "poking their noses into the aircraft business"; and at civil flying—"fares are too high and aeroplanes too noisy." If we made flying cheap, holidays could be spread, with people enjoying North African sunshine in winter. It was here that the reference to laminar flow came in—though not that Sir Frederick, as he himself said, was wishing to use an occasion like this "for propaganda purposes." His last word, however, was serious: the slump which would come in military aircraft would never be filled by civil orders.

Both S/L. Radford and F/L. Henderson (the latter a New Zealander serving in the R.A.F.) had to say a word or two: the McKenna Trophy winner stressed that maturity of outlook was important for getting the best out of the course, the Edwards Trophy holder commented that he had enjoyed the course but "wouldn't like to try it again." Finally Lt. J. J. Taylor of the U.S. Navy presented the Commandant with a set of models of current American aircraft and a letter from Lockheed Aircraft Corporation saying in what high esteem the E.T.P.S. is held in the United States.

Sopwith Apprentices Reunite

MELLOW anecdotes and reminiscences flowed freely as ever at the fifth annual reunion dinner of the Sopwith Apprentices Association, held in London on December 2. Mr. R. W. Sutton was in the chair, and the guests included Sir Thomas Sopwith, Sir Frank Spriggs, Sir Roy Dobson and Messrs. J. T. Lidbury, Jimmy Jeffs, Joe Taylor, Nat Somers, Neville Duke and Norman Jones. Speakers included A.V-M. L. T. Pankhurst, Mr. J. Bewsher and Mr. J. H. Williams.

Mr. Sutton made particular allusion to the great Sopwith and Hawker pilots—Harry Hawker, Basil Watson, Victor Mahl, "George" Bulman, Philip Lucas, Dick Reynell and Neville Duke. Of particular interest among Sir Thomas's reminiscences (to one guest at least) was his account of how Fred Sigrist first joined him. In 1908 Sir Thomas and one Bill Ayre bought an old schooner for £500. She had a Thorneycroft paraffin engine. Occasion arose to procure the services of an engineer and Bill Ayre came across a young man pushing a file on a bench. He did the job, and it was suggested to him that he would like to go to sea. He agreed that he could do with some fresh air and from that time onward Sir Thomas had a happy association with him until the day he died. He was very largely responsible for the mechanical end of Sir Thomas's early flying. That led to his becoming chief mechanic, works manager, managing director, and so on. Fred Sigrist should be an inspiration to the young in aptitude and guts.

Sir Thomas also pronounced on a point which should interest historians—that the men mainly responsible for the design of Sopwith aircraft in the 1914-18 war were H. Smith and J. Bewsher (Smith succeeded R. J. Ashfield late in 1915). Sixteen thousand aircraft were built to the designs of these men.

In all his career, Sir Thomas said, he had never known any man with such a capacity for work as Sir Roy Dobson. He counselled him not to overdo it.

Mr. J. H. Williams remarked that it was sometimes said that the forerunner of the Pup was designed in chalk on the floor. This he declared was absolutely true—he remembered Sir Thomas, Harry Hawker and Fred Sigrist on their knees.

IN BRIEF

A Tokyo report gives the number of Orpheus 805 engines ordered by the Japanese Defence Board from Bristol Siddeley Engines Ltd. (this page, last week) as 32.

English Electric Aviation have appointed Mr. J. O. Charlton, F.C.I.S., company secretary; and W/C. J. L. Dell deputy chief test pilot, responsible to Mr. R. P. Beamont, manager of flight operations and chief test pilot.

Hunters are not to be supplied to Cuba to replace her Sea Furies. Lord Lansdowne, the Foreign Under-Secretary, said in the Lords on December 2 that in the Government's opinion "tensions have not yet sufficiently diminished to warrant a change of policy."

A B-47 flew continuously over the November 27-30 weekend, setting up what the U.S.A.F. claimed as an unofficial jet endurance record of 80 hr 36 min. Between taking off from Dayton, Ohio, on the Friday and returning on the Monday it covered a distance of 39,200 miles.

The Minister of Aviation, with the agreement of the Secretary of State for Air, has appointed G/C. E. M. T. Howell as Director of Air Armament Research and Development with effect from January 1 next year. He succeeds A. Cdre. R. H. E. Emson and is to have the acting rank of air commodore.

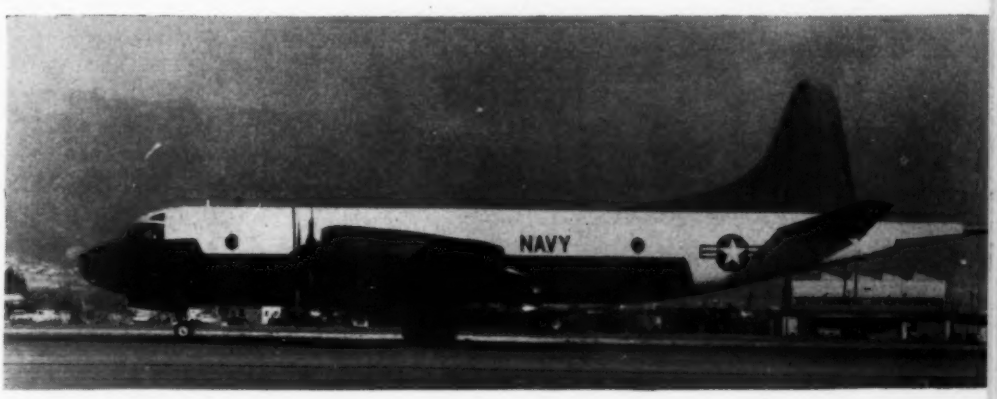
Payments by the Government to the aircraft industry between April 1951 and March 1959, for airframe and engine research and development, amounted to £430m. This was stated by the Minister of Aviation, Mr. Duncan Sandys, in Parliament on November 30. He said that some £24m had been received from the industry in royalties on aircraft developed with Government assistance and sold to customers abroad.

Dr. W. J. Bushell has been co-opted to the board of Cellon Ltd. and been appointed deputy chairman. He is director and general manager of the chemical division of Courtaulds, the parent company. Mr. A. Wallace Barr has been appointed Cellon managing director from January 1, succeeding Mr. W. J. Shilcock, who is retiring after 46 years' service; and Mr. F. J. Smith becomes secretary from the same date.

Members of the panel at the December Forum of the Aircraft Recognition Society will be Messrs. Peter Masefield, G. R. Bryce, A. V. Cleaver, and Peter Brooks. Mr. E. Colston Shepherd is to compère the meeting, which will be held on December 17 in the library of the Royal Aeronautical Society, 4 Hamilton Place, Park Lane, London, W.1, at 7 p.m. A particular welcome is extended to *Flight* readers.

"FLIGHT" INDEX

THE index to Vol. 75 (January-June, 1959) of *Flight* is now available, price 1s (by post 1s 3d), from Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1. Readers' own copies of this volume can be bound (with index) at a cost of 25s, return postage included; or binding case and index are available separately, price 7s 6d (by post 9s). Copies for binding (with sender's name and address enclosed) should be forwarded to Iliffe & Sons Ltd., Binding Dept., 4/4a Iliffe Yard, London, S.E.17, and advice and remittance sent separately to the publishing department at Dorset House.



MIGHTY HUNTER: At the beginning of this month, Lockheed's California Division flew the operational prototype of the P3V-1 anti-submarine hunter/killer for the U.S. Navy. Differing in many important respects from the Electra airliner from which it is derived, the P3V is fully pressurized, yet can carry a vast assortment of stores both internally and externally

Missiles and Spaceflight

SPACE LAW AT THE A.R.S.

MOST lawyers disclaim any desire to be among the first men to venture into space, but it was clear from the papers presented at the space-law session of last month's American Rocket Society meeting in Washington that America's legal minds had given much thought to the space-age problems of their particular subject.

Peter W. Rodino, Jr., a Congressman from New Jersey who spoke on the subject *Rocket to Peace*, observed that lawyers "should be called in on the problems of space long before *any* astronaut completes his mission." He did not propose that anyone should attempt to sit down and codify a space code of intricate detail to cover any or all dimly foreseeable situations; instead, certain basic principles should be set down. Mr. Rodino's basic principle was that "space shall be free to all nations" (all other speakers also gave the strongest kind of support to this particular tenet).

Echoing his fellow-representative's views on the need for urgency, Emilio Q. Daddario (Connecticut) suggested in his paper, *Public Understanding and the Need for Space Law*, four specific areas which might serve as a "point of beginning." These were (1) reallocation of radio frequencies for space vehicles; (2) registration of satellite and space-vehicle launchings; (3) liability for damages or injuries caused by space vehicles, and (4) arrangements for re-entry and landing experiments. The burden of responsibility for a space law lay directly on the U.S. Congress, he stated.

Many of the lecturers made pleas for better communications between the legal and scientific communities. Without such mutual education, the formulation of a lasting space law was made all the more difficult. The Dean of Santa Clara University's Law School, Leo A. Huard, said that the physical scientist could not think of space exploration only in terms of experiments or equations; the sociologist could not develop his theories and initiate "man in space" projects with his resources alone; nor could the lawyer draft laws and make rules in a factual vacuum. "These three disciplines are universal and consequently overlapping."

Andrew G. Haley, delivering his paper *Space Law—Retrospect and Promise*, quoted a *Life* magazine editorial which stated, "There is something offensive to common sense about the extension of earthbound national sovereignties to other planets. The least we can ask of our international lawyers is that they make space as free as the high seas." However, in Mr. Haley's opinion it was obvious from a legal standpoint that "the closer the two great astronautics Powers approach the Moon the more distant they become with respect to resolving the problem of lunar sovereignty and the rôle of law in outer space." But these prospects did not seem to alarm either American or Russian lawyers, and it was therefore apparent, in Mr. Haley's opinion, that the urgent task of formulating a space law must be undertaken by non-governmental international organizations such as the Space Law Institute of the International Astronautical Federation.

It was indeed a pity, said the speaker, that purely national committees and official international bodies had so far been incapable of "synoptic thinking." An interesting legal point brought out in his paper was that because of universal acceptance of the IGY astronautics programme, "all nations had agreed by common consent to an evolutionary step and what may now be termed the first approximation of a principle basic to the common law of mankind." Continuing, Mr. Haley stated: "The principle which was accepted by the nations, namely, that outer space may be used for peaceful and scientific purposes without regard to subjacent territory, is momentous indeed. Here we have the first implementation of legal principle that space beyond the atmosphere is *res extra commercium*, as C. Wilfred Jenks says, 'incapable by its nature of appropriation on behalf of any sovereignty' and the equally appropriate application of *lex communis*, the principle, as applied to the cosmos, that if any claim to ownership may be maintained, such claim is on behalf of all mankind.

In contrast to some of the demands for a very definitive international agreement, Mr. Huard made a plea for a simple "space law code" which was not necessarily a collection of restrictive rules. On the contrary, he suggested that a brief statement of general principles would be adequate for the present. "The Ten Commandments have been law for many, many years without being long, verbose and, in any proper sense, restrictive of man's moral, cultural and social development. I ask you to think of a code of space law as something in the nature of Ten Commandments for a space-oriented society."

Lawyers often decry, as some of their number did at the A.R.S. meeting, the amateurish attempts of technical people to formulate a space code. At least one engineer, after reading Mr. Huard's speech, observed that, if all mankind obeyed the *original* Ten Commandments, the question of a special law for outer space would be completely redundant.

DON ADAMS

SPACE RESEARCH AT SLOUGH

The Radio Research Station of the Department of Scientific and Industrial Research at Slough is to undertake "investigations of the upper atmosphere and outer space by both radio and non-radio methods." The work of the station has been enlarged to include the use of radio and optical methods for tracking satellites, and "steps have been taken" for the provision of a radio telescope. This work will occupy about half the total staff effort of the station, i.e., about 80 scientists and assistants.

The D.S.I.R. in its announcement of these changes commented "The Radio Research Station has earned for itself an international reputation for its detailed studies of the propagation of radio waves by way of the ionosphere and the troposphere. Recently the programme has been reviewed and its scope has been extended so as to take advantage of the new techniques provided by rockets and artificial Earth satellites."

Also announced was the appointment of J. A. Ratcliffe, C.B.E., F.R.S., as director of the Radio Research Station on the retirement of Dr. R. L. Smith-Rose, C.B.E., in October 1960. Mr. Ratcliffe is at present head of the radio section at the Cavendish Laboratory, Cambridge.

VENUS OBSERVED

Optical observations and photographs of the planet Venus were obtained by two U.S. scientists who ascended to 81,000ft by balloon on November 28-29. The flight, which lasted 24 hr, was made by Cdr. Malcolm Ross of the Office of Naval Research (which sponsored the project) and Charles B. Moore, Jr., of Arthur D. Little Inc. Launching was from the "Stratobowl" near Rapid City, South Dakota, and the landing was made 20 miles north of Manhattan, Kansas.

The scientists' observations were made through a special mechanism built to focus into the mirror of a 16in telescope attached to the top of their sealed gondola. The balloon was made of a 0.002in plastic skin, filled with helium, and its inflated diameter was 172ft. Manufacturer of the balloon was Winzen Research Inc. of Minneapolis.

A symposium devoted to the subject of space trajectories will be held in Orlando, Florida, on December 14 and 15. Held under the auspices of ARPA and the American Astronautical Society, the meeting will be organized by the research division of Radiation Inc.

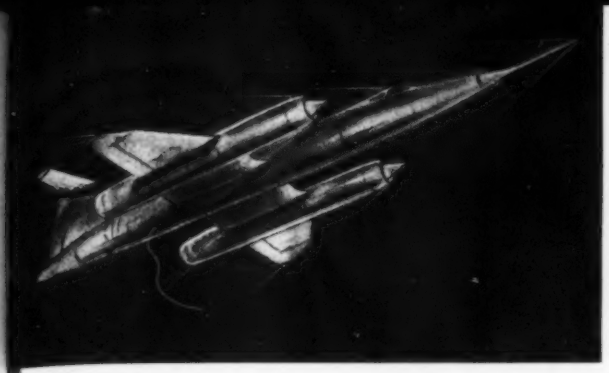
According to our American contemporary *Missiles and Rockets* it costs some $33,000 for a C-124 to fly from Dover A.F.B., Delaware, to pick up a Thor IRBM from Douglas at Long Beach and fly it to Lakenheath, Suffolk.

As part of a programme sponsored by the U.S. National Science Foundation, the American Rocket Society has received a grant to finance the translation and dissemination of important Russian articles in astronautics. These are to appear quarterly as part of the January, April, July and October issues of the *ARS Journal*, the first ten translations having appeared in the October 1959 issue.

Plans to launch a 100ft diameter inflatable sphere into orbit as a communications experiment were announced on Monday last by the U.S. National Aeronautics and Space Administration. Known as Project Echo, the experiment involves the launch from Cape Canaveral of an aluminium-coated sphere into a 1,000-mile-altitude Earth orbit early in the spring of 1960. Test objective is "to test the feasibility of a passive reflector communications system on a global basis."

Six "nuclear emulsion recovery vehicles," customarily abbreviated as NERVs, are to be launched next year by the U.S. National Aeronautics and Space Administration to study the lower Van Allen radiation belt. A product of the missile and space vehicle department of the General Electric Co., NERV incorporates an ablative re-entry capsule, in the nose of which a nuclear-emulsion unit can be extended and retracted. Ionization particles between 200 and 1,800 miles altitude will be recorded as traces on the emulsion when the instrument is extended. Launching rockets are expected to be Argo D-8s and Scouts.

A joint memorandum has been published by the U.S. Defense Department and the National Aeronautics and Space Administration to define the interim management of Project Saturn prior to its formal transfer to NASA. Under this agreement the project will continue to receive funds "at current levels," and its technical direction will be the responsibility of the NASA administrator acting "with the advice and assistance of a Saturn committee composed of representatives from NASA, ARPA, ABMA and Air Force." Administration of the project will be by the ARPA director, and work on Saturn will continue to be conducted by the Army Ballistic Missile Agency.



BRISTOL 188

Fastest Conventional Aeroplane in the World

By the TECHNICAL EDITOR

IN October last year it was announced by the Ministry of Supply (now the Ministry of Aviation) that they had signed a contract with Bristol Aircraft for the development of a stainless-steel supersonic research aircraft. Designated Bristol Type 188, it is potentially the fastest aeroplane in the world of which details are known, except for the North American X-15 (which cannot take off by itself, but must be launched from a parent aircraft). It is a machine of very great technical interest, and on this and the following page we are able to reveal its configuration and draw a number of conclusions.

Initially, of course, one may well ask what the 188 is intended to accomplish. Just when the project started has not been divulged; Bristol Aircraft certainly started to investigate supersonic structures and methods of fabrication several years ago, the Type-number itself is no small clue, and a sure date is the appointment of D. I. Vickery as design manager for the aircraft in March 1954.

At about that time there were many projects throughout the British industry for military aircraft capable of Mach numbers of 2 or more, and there is little doubt that when the M.o.S. commissioned the 188 they kept at least one eye on future military requirements. Today there is no publicly acknowledged military requirement for high-Mach aircraft at all, and the T.188 programme may have suffered both in timing and in finance as a consequence. Actually it is to the undying credit of the Ministry concerned that they have continued to fund the aircraft; and, in fact, this may well turn out to be the first major example in recent years of a non-military aircraft being financed by British public funds.

In planning a supersonic aeroplane of any type there are so many major variables and so many really critical choices to be made that it is no easy task to finalize the design at all. In the case of the 188 it seems obvious that a design Mach number of about 2.5 was chosen at the outset, but many months seem to have elapsed before the propulsive system finally settled down as a pair of de Havilland Gyron Junior PS.50 engines (DGJ.10R rating), with a maximum reheat thrust (sea-level static) of 14,000 lb each. They could have been put in the fuselage, as on the Avro Arrow, or hung under the wing, as on the defunct F-108, or even slung above and below, as on the Bloodhound; but in the event the engines were mounted about half-way along each semi-span, with their centrelines on the wing. This at least facilitates the installation of alternative powerplants (which can always happen to a research aircraft) and also allows fuselage shockwaves to create favourable intake conditions.

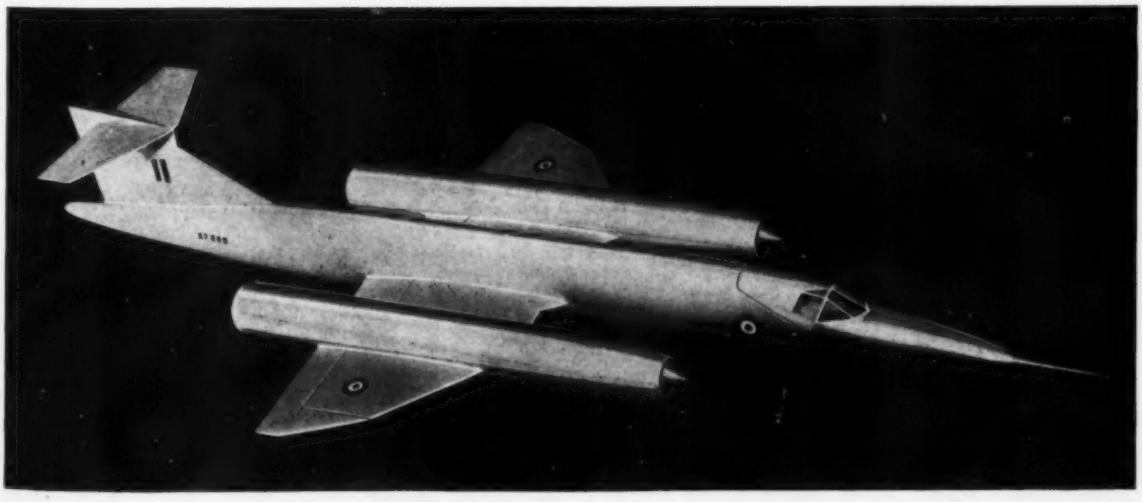
In any supersonic turbojet installation the intake and exhaust design is as important as the engine itself. In the 188 air is taken in via a circular pitot intake with a conical centrebody, which obviously must move axially to maintain the optimum pressure recovery. After subsonic diffusion the air—already very hot—enters the engine proper, traversing the variable-incidence intake guide vanes and first-stage stators, and then being compressed in the extremely efficient eight-stage compressor until it enters the combustion chamber at about the same temperature as the gas entered the turbine in the first Whittle engine. Kerosine is burnt in the high-intensity annular combustion chamber, and after passing through the two-stage turbine the gas is reheated to 2,000 deg K in the very advanced afterburner. The latter, which in the 188 is obviously separated from the engine by some 15ft of pipe, ends in a multi-petal nozzle so designed that the final discharge diameter does not exceed the basic diameter of the engine envelope. At subsonic speeds the nozzle is convergent; it opens up at supersonic speed to a parallel form at about M 1.4 (full reheat) and to a divergent form at full speed.

The superficial configuration of the 188 is amazingly conventional; in fact, it is of a form suggested by many aerodynamicists as early as 1946. Nevertheless, we may be sure that Bristol were not drawn to the layout by sentimental attachment to the Meteor and Canberra, but by the fact that it makes a great deal of sense. The only choice which might be questioned is the use of a rear-mounted tailplane; doubtless the close-knit nature of the aircraft—the span is less than that of most Austers—militated against putting a foreplane anywhere ahead of the intakes.

Wing design is fundamental. As on the defunct Avro 730 the wing appears to be chiefly occupied by nacelles and fuselage; but the part which is left to provide lift has a biconvex section (t/c ratio 4 per cent) and a leading-edge sweep ranging from zero inboard of the engines to 38 deg and finally to 64 deg. The biconvex section is another reminder of the past, for such a wing was actually flown on a Miles Falcon 14 years ago in preparation for the E.24/43 (M.52) research aircraft (the cancellation of which still appears to have been a major blunder). In fact the 188 looks faintly like a twin-engined version of that pioneer project.

Nothing has been divulged concerning leading-edge flaps, or droop-snoots, or supercirculation; but the wing is known to carry trailing-edge flaps inboard of the nacelles and ailerons outboard. The latter, obviously fully powered, seem to be a compromise between the all-moving tips of the Bomarc and the conventional lay-out. The small leading-edge extensions along the fuselage and

Britain's fastest aeroplane will have a most striking appearance, which even at rest suggests the flashing performance of which it will be capable



BRISTOL 188 . . .

Powerplant is the de Havilland Gyron Junior DGJ.10R, which combines great supersonic thrust with minimum frontal area. Equipment includes a fuel/oil heat exchanger, a Dowty fuel and control system and high-augmentation after-burner

inboard side of the nacelles seem to be an attempt to improve junction flow. Bristol state that the wing combines low supersonic wave-drag with good transonic characteristics, and thousands of hours of all kinds of tunnel testing have gone into its evolution. It is pertinent, however, to comment that an F-108/B-70 wing would have provided far greater area within the same span and would have distributed wing volume over a much greater axial length. The three-view reveals that the aileron jacks cannot be accommodated within the wing profile.

Axial distribution of cross-section is optimized by a slight waisting of the fuselage, which otherwise has a fine profile and an oval cross-section determined by the frontal area of a pilot in an ejection seat. In it are housed the pilot (the sole occupant), the fuel, the main and nose units of the landing gear and a vast amount of instrumentation. The pilot appears to be seated conventionally, and to enjoy fair vision through panels of heat-resistant glass mounted in the sloping windscreen forging and in the large hinged metal canopy. To the rear fuselage is attached the squat fin (leading-edge sweep, 65 deg) which must be stressed to meet engine-failure at full design speed. The fin carries a constant-chord rudder, and its tip is hinged and powered to drive the one-piece horizontal tail.

Practically nothing may be revealed of the very interesting structure of the aircraft. Practically all the major portions of airframe are constructed principally in special types of stainless steel and a high proportion of the joints are effected by welding. It would seem logical to assume that many of the exterior panels are of some kind of sandwich construction. The port and starboard main legs are both cantilevered from anchorages on the flanks of the centre fuselage, like the main gear of the F-104. The forwards-retracting nose unit is steerable and employs twin wheels. A braking parachute is contained in the extreme tail.

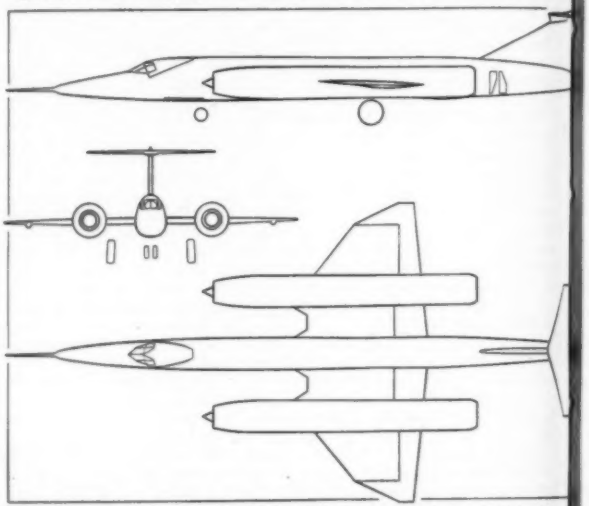
Of the 188's internal systems nothing may yet be said. It is clear, however, that in this respect this one aircraft is responsible for more hard work at the drawing board, and more arduous testing on rigs, than any other aeroplane outside the U.S.A. (and perhaps Russia). Like its structure, the systems of the 188 press against, and often force beyond, the boundaries of previous British knowledge. It is particularly in such matters that the true worth of the aircraft is manifest, for without it no British supersonic transport design for a sensible Mach number could even be contemplated. Bristol have not yet named any of their "systems" subcontractors, but there cannot be very many famous names who do not have a finger in the 188 pie. Unfortunately, one does not get very fat on research contracts.

More than one 188 is on order, and the first is in an advanced stage at Filton, Bristol. Within the next few weeks a pair of 188 powerplants will be tested in XA552, one of the first Javelin Mk 1s, which Napier have re-engined for de Havilland Engines in order to allow these very advanced propulsive systems to acquire flight time ahead of the 188 itself. In addition, detailed investigations have been in hand for some time at the N.G.T.E. Meanwhile, Godfrey Auty, already an experienced jet pilot, is to gain supersonic experience with the Lightning, FD.2 and probably some American types, such as the F-104.

Since they are the property of the Crown, the 188s will bear Service roundels, and the first machine will carry the serial number XF923. It is unlikely to be painted; instead its steel skin will be burnished to a high polish, producing a finish like that of an Atlas ICBM. It would be unwise to forecast when XF923 will be rolled out or start its flight-test programme Since the 188 is a research machine, adherence to a previously agreed schedule is less important than in the case of airliners or military aircraft. But all concerned are making great efforts to ensure that when the aircraft is finally cleared for flight it is the most efficient research tool that the British aircraft industry can produce. Already the project has consumed a very large quantity of man-hours, and it would be foolish to hasten the start of 188 flying. Even when the flight stage has been reached it will be many months before every nook and cranny in the 188's enormous performance envelope can be explored. In view of the fact that the low-speed handling is expected to be comparable with that of the latest supersonic fighters it is probable that the 188 will have a wider speed-range than any other aeroplane.

Although Bristol Aircraft have a superb runway at Filton, the chances are that the 188 will first fly from the R.A.E. Bedford. The initial phase of its flight-test programme will be the usual familiarization and general evaluation of its handling. Thereafter the performance boundary will be explored and probed during at least 100 flights, before the limits of the type's capability are reached. Moreover it may well be that the airframe and systems have been designed for sustained flight at Mach numbers greater than the maximum obtainable with the present propulsion system. One can visualize all manner of different powerplants being evaluated by this aeroplane, and in particular it would appear to be an excellent test-bed for ramjet and combination turbojet/ramjet systems of the type envisaged by Bristol Siddeley Engines for future airliners.

In fact, powerplant research may well prove to be the largest single item in the long list of experiments to which this aircraft will be assigned. Other major tasks are likely to embrace such areas as instrumentation, control and navigation systems, accessory power systems of all types, cabin-conditioning and possibly the evaluation of aerodynamic surfaces with optimum lift/drag ratio or control effectiveness. Whether or not "gloves" can be employed at such speeds to modify the wing profile



Bristol 188 (two D.H. Gyron Junior DGJ.10R): Span, 35ft 1in; overall length, excluding probe, 71ft; height 13ft 4in; gross wing area, 396 sq ft; fuselage cross section, 3ft 9in max width by 4ft 11½in max depth; design speed, "more than 1,500 m.p.h." All other data are at present restricted.

appears uncertain in the extreme. It is also highly unlikely that the configuration of the 188 approximates to any conceivable airliner, so that it cannot be regarded as being a scale model of something larger yet to come.

Although the investigation of flight at Mach numbers greater than two is exceedingly costly, the 188s are likely to be employed on a host of projects over a period of many years. It could be that at least one machine might be turned over to the Aircraft Research Association, should the results from one particular set of experiments become of obvious commercial value to a particular company. Work might also be done under contract for other European or Commonwealth countries. As noted in a leading article in this issue, the U.S.A. are continuing to fund the B-70 intercontinental bomber as a research vehicle. This aeroplane is far larger than the T.188 and will be capable of carrying much more instrumentation and of evaluating complete airliner systems while maintaining 2,000 m.p.h. for more than three hours—ensuring complete heat-soak throughout the aircraft. Such a task is quite beyond the ability of British aircraft, but the Bristol 188 is nevertheless a vehicle of the utmost value, not only to a nation without any other aeroplane of comparable performance but also as a morale-booster to an industry which badly needs one.

Men behind the 188: Dr. A. E. Russell, C.B.E., D.Sc., F.R.Ae.S., F.I.A.S., director and chief engineer; Dr. W. J. Strang, B.Sc., Ph.D., A.F.R.Ae.S., chief designer (fixed-wing aircraft); Mr. D. I. Vickery, A.F.R.Ae.S., assistant chief designer (fixed-wing aircraft) and Type 188 design manager; Mr. F. J. Chard, M.B.E., Type 188 project manager; and Mr. G. Auty, deputy chief test pilot (and scheduled to conduct the initial test flying)

Import and export vehicles make a useful fill-up load at off-peak periods. These are DAF cars manufactured in Holland

BRIDGING THAT GAP

WHAT PROSPECTS FOR THE VEHICLE AIR FERRY?

By D. A. WHYBROW*

ELEVEN years ago, to their very considerable credit, Silver City Airways started in a small way the world's first commercial service for the combined transport of passengers and their motor vehicles by air. They operate mainly on the Lydd - Le Touquet route, where large numbers are transported over a short distance. Other services are operated to Cherbourg, Deauville, Calais and Ostend.

In 1954 Air Charter was granted licences for additional vehicle ferry services, from Southend to Calais and subsequently from Southend to Ostend and Rotterdam, using Bristol 170 Mk 31s, of which they already had experience, on the run between Berlin and Hanover and Hamburg. The demand for the services from Southend to Calais was encouraging, and in 1955 they took delivery of the first two Mk 32 (long-nosed) Bristol Freighters (the fleet is now nine). By December 31 a year's total of nearly 12,000 services will have been operated on the Calais, Ostend and Rotterdam routes and 20,000 vehicles, 100,000 passengers and between 5,000 and 6,000 tons of freight will have been carried.

One of the problems which first faced Air Charter in starting the Air Bridge services was that Southend was not on the traditional route to the Continent; and although the relative costs were fairly obviously favourable, a different sales approach was needed.

Early this year, following a long period of examination and investigation, the Air Bridge announced two important plans for its future operations: an aircraft to succeed the Bristol 170 and seven proposed long-range vehicle ferry services, to Tours, Paris, Lyons, Dijon, Strasbourg, Dusseldorf and Bremen. The events which led up to these two significant announcements are examined below; they are related to the peculiar problems of vehicle ferry operations and the changing habits and demands of the Continent-touring motorist.

Although fairly suitable for vehicle ferry operations, the Bristol Mk 32 is not outstandingly economical and maintenance costs are high. When the Air Ferry first came into operation eleven years ago the average British motor car was about eighteen inches shorter than it is today; but, despite this, load factors had to be high to achieve economical operation. The average number of passengers accompanying cars was low enough to make this very difficult, and with the length of the most popular family models increasing it is becoming increasingly hard to obtain a three-car load in the 42ft of space available, despite vehicle fares aimed to attract the owner of the small car.

Very much smaller models are now being introduced, but they are not yet used in large numbers for Continental touring, where the "family size" car still predominates. The following table shows the increases in length of the most popular models over the last nine years:—

	1950		1959	
	ft	in	ft	in
Austin A40-55	12	9	14	10
Bentley	16	0	17	8
Ford Consul	13	9	14	5
Hillman Minx	13	0	13	6
Humber Snipe	15	8	16	5
Jaguar 3½—Mk IX	15	8	16	5
M.G. Magnette	14	0	14	10
Morris Oxford	13	11	14	10
Rover 75—Three Litre ...	14	11	15	7
Standard Vanguard	13	8	14	4
Vauxhall Velox	13	9	14	10
Wolseley 6/80-95	14	9	15	8
Average length	14	5	15	3

This average multiplied by three in 1950 was 43ft 3in and in 1959, 45ft 9in, showing—purely theoretically—an excess of 1ft 3in over the available hold length in 1950 and 3ft 9in in 1959. More relevant perhaps is that two cars of this average length in 1950 would have left space to book a car 13ft 2in in length but in 1959 would leave only 11ft 6in. The chances of booking a car up to 13ft 2in overall length are obviously greater than those of being offered one from the much smaller market of under 11ft 6in overall length.

The following list shows the percentages of different makes of cars carried on the Channel Air Bridge routes in 1958: Ford, 23; Austin, 14; Morris, 10; Vauxhall, 8; Hillman, 6; Standard, 6; Bentley, M.G., Jaguar, Rover, Humber and Wolseley, 18; other British cars, 6; foreign cars, 9.

Other operating problems which are not so obvious as car length include the loss of one-third of the payload if, as frequently happens, a booked car fails to arrive. No-show is a well-understood problem with passenger carriers, who frequently allow for it by a calculated amount of overbooking. Whilst this is possible with capacity for anything from 30 to 100 passengers, it is clearly impossible for an aircraft where capacity is limited to three cars. Consequently, the owner of a vehicle who becomes a no-show, or who makes a late change or cancellation, represents a considerable loss. A large number of services are affected in this way.

Another problem, seasonal fluctuation, is so varied that it almost defies prediction. As many as 100 or more services a day may be operated at week-ends in early July and as few as 20 in the middle of the week. The effect of this upon adequate staffing, overtime, and other costs is reflected in the peak fares at the week-ends from July to September. The unfortunate facts that 85 per cent of the total cross-Channel car traffic occurs between May and September, and no less than 52 per cent of the outbound traffic in a period of about four weeks in July and August, emphasizes the highly seasonal nature of this type of traffic. Services can still be offered to the motorist at a fair frequency throughout the winter months, but the amount of flying and the revenue earned during this period is small.

It is easy to see that overall utilization is low; not only because of seasonal fluctuations but also by reason of the considerable time spent in turn-round and handling in relation to hours flown. On the Southend - Calais route the turn-round time scheduled is two-thirds of the flying time. On the other hand, on the route Southend - Rotterdam, the turn-round time remains the same—20 min—and the flying time is 70 min. It must be apparent that over the years we have been looking for a more economic aircraft than the Freighter.

Equipment Problems. The specification for the ideal next-generation ferry aircraft is probably as follows: low basic cost, simple to service and overhaul, 70ft of hold space, accommodation for 25 passengers, and a payload of not less than eight tons and preferably nearer ten. It could usefully be a little faster than the Freighter—and certainly quieter—and the space and payload penalty for providing a toilet and galley should be acceptable.

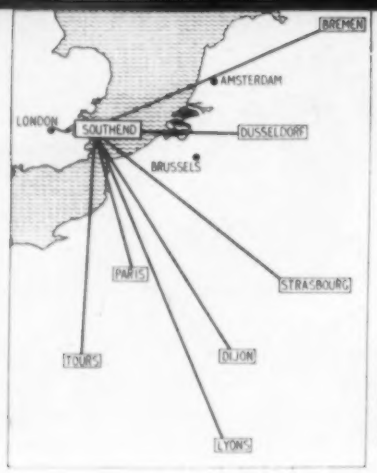
No aircraft operated on the present routes will achieve a high utilization even assuming that its operating costs are lower than those of the Bristol 170 and that fares could be further reduced. If the basic cost of a new type was high, the amortization cost per hour could quickly overtake the economic virtues (turn-round time for a larger aircraft would be a little longer, and extra speed would not make very much difference on short routes). And although the no-show problem would be reduced, the problem of filling the aircraft in the quiet season whilst still offering an attractive frequency would be greater. To illustrate this, whereas the amortization cost of a Bristol 170 Mk 32 amounts to about £15 an hour on a utilization of about 1,000 hours a year, for the AW.670, for example (at an expected basic cost of £650.000) amortization could not be less than about £75 per hour—and this assumes identical utilization. Incidentally, the prospect of finding other work for a large aircraft depends upon having available a pressurized cabin, if only for the crew.

An initially expensive aircraft, or one with the gas turbine's high fuel consumption at low altitudes, could not be considered as a future type for the Channel Air Bridge. And the market looked too small to interest any manufacturer in a specific design.

For a time the problem appeared almost insuperable, but one day Freddie Laker, Air Charter's managing director, announced that he "had an idea." After considerable research and testing this

*Manager, Channel Air Bridge Division, Air Charter Ltd.

BRIDGING THAT GAP . . .



This map shows the "deeper penetration" ferry routes to the Continent projected by Air Charter

idea is now taking shape as project ATL 98 in the hands of our associated engineering company, Aviation Traders Ltd., at Southend.

DC-4s, which Air Charter have operated for over five years, are plentiful. They are now freely available at around £70,000 apiece and in 1961 will probably cost about £50,000. DC-6s are unlikely to cost more than £75,000 by 1963-64 and by then it is possible that DC-7s will cost no more. Basically, the idea of the ATL 98 is, in the designer's own words, "to put a saw through the aircraft forward of the leading edge of the wing and to build on a new nose in which the crew would be accommodated above the hold, more or less as in the Bristol 170."

The result is almost exactly what one could ask for in a 170 successor. It will have at least 68ft of hold space for five small or four of the largest cars and a payload of nearly 19,000 lb. The total cost with conversion should be £130,000 and we can look to future development (with DC-6s and -7s) for a period of not less than 15 years; initial plans are to build ten DC-4/ATL 98s for our own use.

"Deeper Penetration" Routes. The new aircraft gives the flexibility required to plan in detail new routes which should interest relatively large numbers of motorists (see "Deeper Penetration for the Channel Air Bridgehead," *Flight*, June 19). A plan which provides services for even a minute percentage of the total motorists touring the Continent has attractive repercussions on the utilization problem. Carrying a little a long way helps to balance some of the problems created by carrying large numbers on short distances, and the resultant increase in fleet utilization can bring cheaper fares for both types of customer. This is a lesson illustrated by two of our existing services: carrying five times as many vehicles on the 28 min Calais service as on the 70 min Rotterdam route has shown that differences in revenue are largely balanced by lower costs and greater utilization on the longer stage.

Destinations (see map) for our "deeper penetration" routes were selected from a wide variety of information about motorists' travelling habits. Distances and times are detailed in the table below:—

TABLE I: DISTANCES AND FLIGHT TIMES OF DEEPER PENETRATION ROUTES

Southend to	Distance (n.m.)	Flight Time (min)* Bristol 170	ATL 98
Paris (Le Bourget) ...	181	83	60
Dijon	320	148	107
Lyons	407	193	137
Strasbourg	350	162	117
Tours	255	118	85
Dusseldorf	233	108	78
Bremen	323	149	108

* Does not include chock-to-chock time.

Attracting the Motorist. In order to provide the right frequency of service, the starting point in the United Kingdom had to be investigated. To obtain both an attractive service and a reasonable load factor in both directions there is something like an optimum frequency for each service, and the wrong selection of timing or frequency can greatly reduce the attractions of the service offered. Fares may not be low enough to attract vast numbers of people for the first few years, but there will be large incidental savings in time and money.

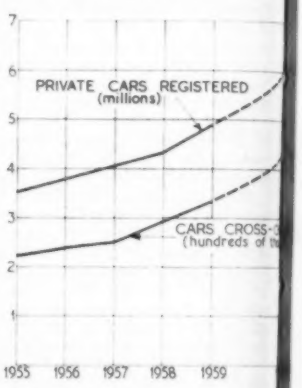
The number of motoring tourists has gone up steadily every year, with the ownership of private cars increasing by leaps and bounds. Thus an established route gains a natural increase annually if its own share in the number going abroad is based on "attraction" rather than "overflow" from other more established services.

Undoubtedly, Silver City and ourselves do cater for a small number turned away if the slightly cheaper boat services are full. This percentage is not great, and one way or another it will doubtless always be with us. The longer range services have so much more to offer that it is extremely unlikely that they will be affected by this percentage as their attraction is complete in their own right.

A number of side benefits arise in the operation of longer vehicle-ferry services. For example, a booking clerk requires no more effort or time to book a car to Lyons than to book it to Calais, and the same effect is felt in a hundred ways throughout the operation. There is thus a lowering of overheads in relation to revenue earned.

Also, one of the most important features is that keeping a proper balance of long and short routes avoids the temptations of the mass market with its lower efficiency, comfort and standards of personal service.

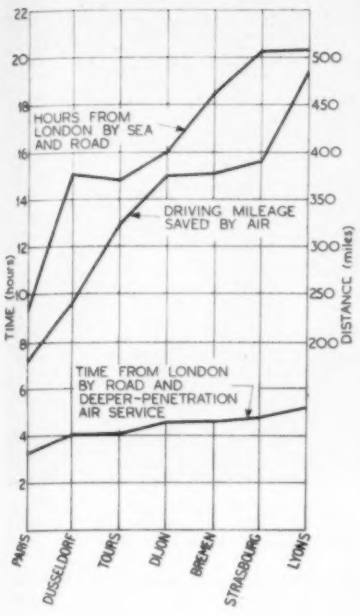
Importance of Freight. Some assistance from freight and supplementary passengers is necessary for an economic vehicle-ferry service, not only because of the small average number of passengers for each car, but also to cover the peaks and troughs of demand. Supplementary passengers do not come in sufficient numbers to help in the vital off-season period, but we have had a considerable measure of success in building up freight traffic despite an absurd air freight rates policy practised by I.A.T.A. Three times in recent years freight rates have been subjected to a five per cent increase. If this was necessary, it is extraordinary that commodity rates should not have been affected in the same way; in our view, the commodity rate policy is quite out of keeping with present-day requirements.



How car registrations and cross-Channel car traffic are rising in unison

The existing I.A.T.A. commodity rate idea should be replaced by a new structure based on surcharges for value and volume. The reduction for quantity—at present only at 45 kg—should be extended to 100, 250, 500, and 1,000 kg, with additional rebates for regular traffic. There should be rate-differentials for freight carried by fast passenger aircraft or freight services and deferred traffic. Also important would be the standard use of a monetary structure more simple than the English one, which requires rates to be arbitrarily rounded off.

Seen here in miniature is the DC-4/ATL-98, Air Charter's new vehicle ferry. Ten are to be constructed by Aviation Traders and should enter service in 1961



Left, saving time and mileage: an Air Bridge comparison

The Bristol 170 Mk 32 forms the backbone of Air Charter's fleet and is now the only type used on the Channel Air Bridge. The colour scheme is red and white

Air-Sea Competition. There can be little doubt that the vehicle-ferry services have had a salutary effect upon the sea services over the years. Surface transport does offer individual examples of good service—particularly on the Townsend Ferry, which retains a measure of personal atmosphere, and on the Bardic Ferry, which provides a leisurely and comfortable method of "deeper penetration" between Tilbury and Antwerp. The Dunkirk ferry offers a useful timing outbound, and it is small enough to provide a good service. Others are less satisfactory.

Because British Railways and the French appear to be committed to a policy of larger vessels, it seems obvious that embarkation, disembarkation and Customs clearance must slow down as traffic increases. The railways' problem is common to all forms of transport; a little more capacity can often be added without affecting overheads and larger vessels are undoubtedly tempting.

It seems possible that hovercraft may be the answer. Smaller units travelling at relatively high speeds and frequencies and with speedy loading and unloading may well do the work of two large vessels. This could be highly competitive to the air ferry services from the South Coast.

There has also been much recent talk about the Channel tunnel. While there is no suggestion that the motorist would be free to drive through it, it would be possible, for example, to provide through car/sleeper trains from Glasgow to Lyons. But doubtless there would be many problems in making people tunnel-minded.

The Channel tunnel, it appears, would be even less able to bear the peaks and troughs of passenger or vehicle traffic than most forms of transport. It will offer faster travel than the surface routes, but its inflexibility may result in severe traffic limitations. It would require a very substantial "bread and butter" business in the freight traffic that now enters the United Kingdom mainly through the port nearest to the eventual destination. Are land charges going to be sufficiently attractive in ten years' time to funnel most of this traffic through the north of France and the Dover area? The tunnel is unlikely to be the magic answer to ultra-low-cost transport between England and the Continent.

The "South Coast Gateway." With the development of better transport facilities, the South Coast is, it seems, an illogical place through which to funnel Continental traffic. The vast natural barrier of the Greater London area has become an obstacle almost equal to the Channel itself. As more than four-fifths of the population of this country live north of the Thames and the Continent, it seems to me that aircraft (or hovercraft) services from the Thames Estuary and from areas north of the Thames have the greatest chance of development.

Many of those now living in the great dormitories of South London travel to Victoria as the starting point of their visits to the Continent. Their journey may in future start somewhere on the outskirts of the Greater London area or in the Thames Estuary, and their next change will be on the Continent.

In developing the Channel Air Bridge we make a considerable study of what we conceive to be the errors and shortcomings of all our competitors. Some of the essentials of the business are determination in the selection of staff allied to a high degree of training, and we believe that there should be a small number of senior executives of wide general transport experience to produce closely co-ordinated teamwork and rapid decisions.

I am sure that the rapid growth of Continental motoring, with all its attractions, will provide ample business for all—whether they are operators of tunnels or hovercraft, of ships or of aircraft. In the last few years there has been real competition between surface and air for the increased traffic coming along. This healthy competition will go on producing better, more frequent, and more convenient services for the motorist.

TABLE II: AIR BRIDGE TRAFFIC SUMMARY

	1954–55	1955–56	1956–57	1957–58	1958–59
	Southend-Calais-only	Southend-Calais, Southend-Ostend	Southend-Calais, Southend-Ostend, Southend-Rotterdam	Southend-Calais, Ostend and Rotterdam	Southend-Calais, Ostend and Rotterdam
Services operated	3,712	5,988	8,654	9,610	10,840
Passengers carried	19,286	31,827	46,641	64,429	86,622
Vehicles carried	6,965	10,261	13,579	14,877	18,446
Freight carried (tons)*	38	613	2,468	3,697	4,055
Revenue ton-miles	747,701	986,951	1,805,411	2,657,392	3,084,782

* In addition 5,300 tons of cattle were carried from 1956 to 1958.

The new terminal at Calais Marck was specially designed to handle air - ferry vehicle traffic

FLIGHT SYSTEM SURVEY

Eurocontrol Meeting in Paris

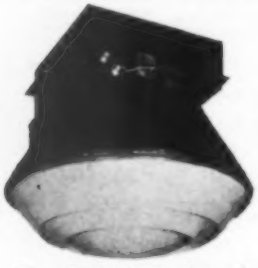
THE meeting of Eurocontrol in Paris ended during last week after exploratory discussions and the presentation of traffic control systems by the Dutch Signaal Company and General Precision Systems Ltd. At the time of going to press, no firm decisions were expected to result from this meeting and it is reported that another meeting is to be held in February next year.

Collins DN-101 Doppler

PRODUCTION versions of the new Collins DN-101 Doppler radar for civil aircraft are to become available in January, and some of the first deliveries are to be made for T.C.A. DC-8s. This Doppler employs a three-beam Janus pattern, transmitting a 1 Mc/s frequency modulation of continuous-wave X-band signals switched to each of the three beams in turn. The receiver detects the third sideband of the returned signal and it is claimed that the F.M.C.W. system overcomes transmitter-to-receiver leakage and vibration effects.

The three beams are transmitted from a single lens aerial at 20 deg from vertical, two of them being projected forward and the third rearwards and to the left. Drift velocity is obtained by measuring the difference between the Doppler shift in the two forward-looking beams and along-heading velocity by measurement of the front left and rearward beams. Comparison of front right and rear beams allows assessment of vertical velocity for cancellation in the computer of pitch, roll, climb and descent errors. The precise centre of the returned signal is determined without manual slewing by three frequency discriminaters which track the received Doppler spectrum from each beam in turn under control of a timer. Each discriminater is calibrated every five minutes by a crystal-controlled calibrating signal and mechanical centring of the discriminater's potentiometer mechanism. The three beam discriminaters are thus calibrated every fifteen minutes to eliminate errors resulting from ageing or change of temperature.

The fixed dielectric lens aerial, of 20½in diameter and 16½in high, has three feed-horns and ferrite switching elements. The same aerial with duplicated feed-horns may be used to transmit two sets of beams when duplicated Dopplers are installed. High aerial gain and narrow beam-width assist in reducing smooth-sea errors and the receiver is automatically adjusted to allow for change of Doppler shift when passing from land to water. In case of loss of signal a warning flag appears and a memory retains the last accurate drift and groundspeed values until reliable Doppler information once again becomes available.



The 21in-diameter aerial of the Collins DN-101 civil Doppler. It radiates a three-beam Janus pattern

The DN-101 consists of a transmitter-receiver, computer-tracker, aerial, indicator and control unit. As noted above, the aerial need not be duplicated in dual installations, although the feed horns and aerial circuitry are different. A single system weighs 57.9 lb and a dual system 98.8 lb. Eleven tubes and 44 transistors are incorporated and power consumption is 249W A.C. and 12W D.C. Accuracy is claimed to be to 1 kt ± 0.6 per cent in groundspeed and 0.5 deg in drift angle. The DN-101 can operate from ground level to 50,000ft and a full range of test equipment has been prepared, including a unit which may be clipped on to the airframe beneath the aerial to check system sensitivity and groundspeed and drift-angle errors. Transmitter-receiver and computer-tracker are respectively packaged in short ½ ATR and long ½ ATR cases. Aerial gain is 29 db, beam width 4.75 deg and the beams are deflected laterally at 45 deg to the aircraft centreline. The aerial may be mounted flush behind a skin cut-out 21in in diameter.

A two-leg, along- and across-track computer, designated NC-103, has been designed by Collins for use with the DN-101. Gyro compass and selected track inputs are required and provision is made for auxiliary course, flight director and autopilot output signals. The computer weighs 18 lb. Greatest indicated along- and across-track distances are 999 n.m. and 99 n.m.

On a 70ft-high concrete tower near the new Arlanda airport, Stockholm, the first of three Decca DASR-1 10 cm surveillance radars is being installed and testing will begin shortly

Doppler V.O.R.

IN order to overcome siting problems in certain V.O.R. beacons, the F.A.A. is experimenting with Doppler V.O.R. which employs a number of aerials arranged in a circle to provide a wide base-line. The cardioid pattern is commutated over the ring of aerials, but a very large diameter is required in order to reproduce the frequency modulation characteristics of the standard V.O.R. reference signal and to maintain compatibility with present airborne receivers. The principle is similar to that of commutated-aerial D.F. developed some years ago by Standard Telephones and Cables and can be applied to either V.O.R. or D.F. Lorenz in Germany produced a mechanical commutation system and from this the F.A.A. has derived other equipment.

F.A.A. has been operating experimental Doppler V.O.R. beacons at Rikers Island, Indianapolis, Charleston and Jackson and has another example under test at NAFEC, Atlantic City. The agency has now placed a $343,693 contract with Servo Corp. of America for another Doppler V.O.R. to be delivered within two months. It will have 50 aerials over a circle 44ft in diameter.

Autonetics in Europe

THE Autonetics division of North American Aviation is opening a European office in Geneva to maintain contact with customers, suppliers, service organizations and participants in joint ventures. The address of the new office is to be 29 Rue de la Coulouvrenière, Geneva, and the director is to be Mr. R. D. Cape. Autonetics is engaged in design and manufacture of inertial navigation and guidance, flight control and armament, multi-purpose radars, autopilots, automatic landing systems, computers and automatic check-out equipment.

Electronic Associates Ltd.

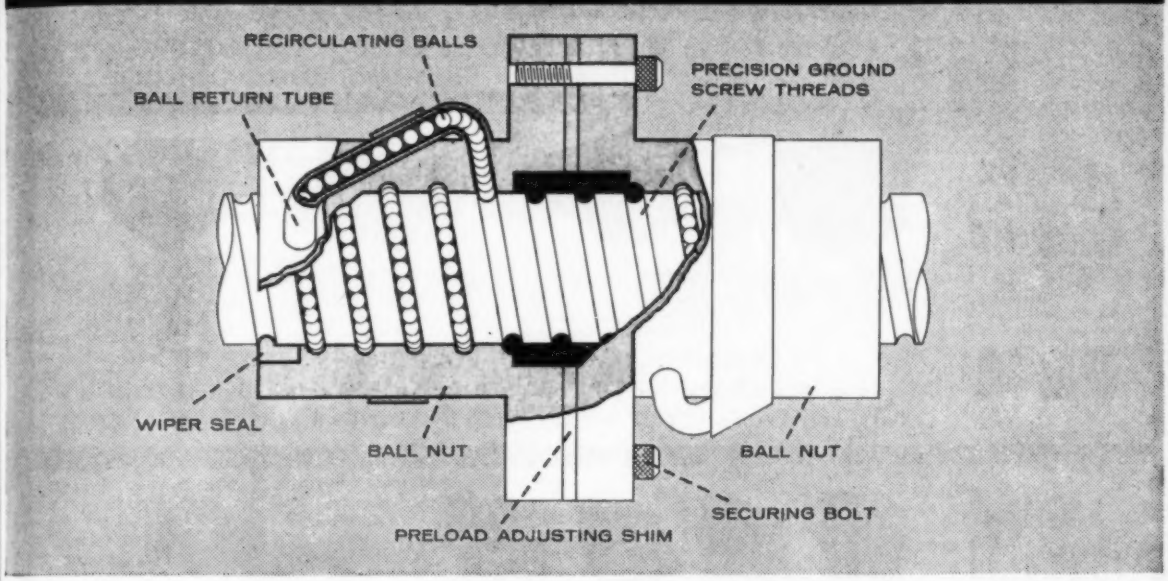
A NEW company under the above name has been formed by Electronic Associates Inc. to manufacture PACE analogue computers, analogue-digital converters and transistorized plotting boards at a factory at Victoria Road, Burgess Hill, Sussex. The company and staff are British and the factory is to be managed by Mr. H. Turner who has been with the American company for a number of years. Some 50 PACE systems have been sold in Europe and more than 300 are produced each year in the U.S.

Close technical and sales co-operation will be possible with the European branch of Electronic Associates Inc. which was formed in Brussels in 1957.

A new miniature 360 deg counter-type indicator has been developed by Smiths Aviation Division. A force of 10 gm/cm will turn the counter and half-degree divisions allow reading to an accuracy of ¼ deg.

The second Solartron radar simulator for Italy was collected from Bovingdon by four Italian Air Force C-119s recently. The first simulator was for the Italian Army and the second for the Italian Air Force. Another radar simulator recently aroused considerable interest during an extensive tour of Europe.

Beaver pre-loaded ball screws, up to 95% efficient, operate at -52°C to over 400°C with no backlash...



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Basic design application analysis

Bristol Siddeley engineers make an exhaustive analysis of each specification. And each unit is specially designed for its particular application. Beaver ball screws are made automatically reversible or with controlled "no-back," with multiple or single circuits. Beaver pre-loaded ball screws have been proved as the most efficient method of converting rotary into linear thrust in over 2,700 engineering applications in many branches of industry. They have been designed already with rated operating load capacities of 370,000 lb (825,000 lb maximum static load) but the maximum potential operating load is, in most cases, limited only by the requirement.

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For further information please write to J. B. Starky, Sales Manager (Beaver Products Division), Bristol Siddeley Engines Limited, PO Box 17, Coventry, England.

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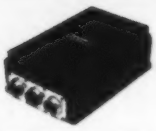

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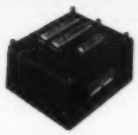

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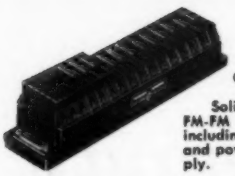

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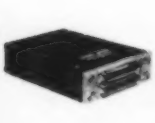

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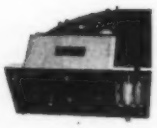

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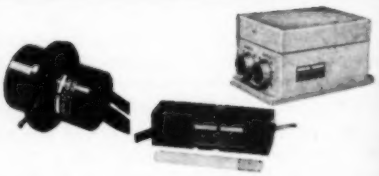

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The crew of the Mi-6 which recently averaged about 168 m.p.h. over a triangular course: (l. to r.) S. Bugaenko, flight engineer; S. Klepikov, navigator; N. Leshin, pilot; and B. Zemskov, pilot

THE following "question and answer" notes constitute, we believe, one of the most interesting documents to date on the subject of Russian aviation. The answers were provided by Mr. Ralph P. Alex, head of the production design components section of Sikorsky Aircraft. Mr. Alex visited the Soviet Union, in his capacity as president of the International Helicopter Commission of the Fédération Aéronautique Internationale, to attend a three-day conference in Moscow. He is also president of the American Helicopter Society and this, too, was a factor in winning Soviet approval for his visit. Mr. Alex travelled more than 13,000 miles through Russia, flying in the new jet and turboprop transports, talking with leaders of the Soviet aircraft industry, and piloting two of their production helicopters. The notes are reproduced, in somewhat edited and abridged form, with acknowledgements to "Bee-Hive," published by the United Aircraft Corporation.

A TECHNICIAN LOOKS AT RUSSIA—*and especially at Soviet Helicopters*

WHAT were your impressions of Russian transport aircraft? I flew in a number and my impression was very favourable. Construction details were fully comparable to those of aircraft in the United States, and the performance was very impressive. Their aircraft philosophy—which is to provide at least 30 per cent excess power, provide for weight growth, hot weather power loss, and greatly increased overhaul times, by operation at low cruising powers—seems to pay off.

The Tu-104A, in which I flew from Moscow to Siberia and return, seemed to be an excellent airplane. The take-offs, even during the 85-degree weather, were within 6,000 to 7,000 feet, and the noise level, though considerably more than the Boeing 707, seemed quite acceptable. There were 70 seats on this airplane, with three stewardesses, and good meals en route. Cruising speeds seemed to be about 500 miles an hour according to the schedule.

The Ilyushin-18, in which I flew from Moscow to Kazakhstan in southeast Asia, is a four-engined (4,000 h.p. Ivchenko) turboprop airliner with a five- to six-hour range. It carried 82 passengers and cruised at an indicated 421 miles an hour at 29,500 feet. The pressurization was good, although abrupt during take-off, climb, and landing. There was a large galley in this plane where the noise was unbearable, but the fore and aft cabins were comfortable.

In Kiev I examined the An-10. . . . The interior of this aircraft seemed to be fitted for troops and cargo-carrying rather than passengers, and there was a ramp for rear loading. The aircraft I saw was ballast-loaded to gross weight and I watched it take off across sod fields within about 18 seconds and an estimated run of 4,200 feet. The aircraft can carry 100 passengers at a stated 403 m.p.h. at 26,000 feet. It has the same power as the Il-18 (four 4,000-horsepower Ivchenko turboprops) and is a medium-range aircraft.

What did you learn about Soviet airline operations? Peter Eromasov, Aeroflot operations chief of the international division, and Nicolai Grachev, inspector general of Aeroflot, offered considerable information on their operations. They said that Aeroflot had carried about eight million people in 1958 and expected to increase this to 21 million by 1961. They said Aeroflot has 210,000 miles of airline routes and more than 1,600 airplanes (mostly twin-engined Il-14s) in the fleet. They said they had 120 airports on scheduled operation and that 200 new airports were being improved or built. Most of these new and improved airports were to be sod and grass fields, and even with large aircraft operation they felt that this would be adequate. In their flights to foreign countries, the traffic is of quite low density, but their internal flights to almost all of the large cities are flown at 100 per cent capacity and there is generally a long waiting list. The Aeroflot people said they are planning to resume negotiations with the International Congress of Aeronautical Organizations, and also with the United States, to provide airline service directly between Moscow and New York.

An Mi-4 of Aeroflot—a type flown by the author

Did you formulate any opinions about Soviet turbine engines? In the engine section of the Chkalov Air Museum, I took pictures of the Kuznetsov 4,000-horsepower turbine which powers the Il-18 and the An-10. This was an axial-flow, two-stage turbine, eight-stage compressor, and seemed to be well designed with good accessories and good details. In a meeting with engine designer Ivchenko, I was advised that the Kuznetsov engine and the competitive Ivchenko engine for these aircraft had both been service evaluated in a quantity of 20 prototype production engines of each model, and that the Ivchenko engine was now replacing the Kuznetsov engine on all production Il-18 and An-10 aircraft.

I also examined the Kuznetsov turbojet which powers the Yak-25 bomber [sic]. This engine delivers 20,000 pounds of thrust with afterburner and is about 34 inches in diameter. Again the detailed design and construction seemed to be excellent. I also saw the AM-3 engine which powers the Tu-104 and Tu-104B. This is a 20,000-pound-thrust engine (no afterburner or water injection) with ample accessory drives and an impingement gas starter of 100 h.p. in the nose section. Mr. Gratchev of Aeroflot said that this engine has risen from a 300-hour overhaul to 1,000-hour overhaul period within the last year.

What is your judgment of Soviet progress in helicopter design and manufacture? All in all, I believe the Russian helicopter industry has done an exceptional job considering the time it has been seriously involved with this machine. The huge Mi-6 is a remarkable accomplishment, and if their effort to establish a new speed record is accomplished, as they expect it will be, it should establish beyond a doubt the future of the helicopter as the most practical of VTOLs.

Did you have much difficulty in obtaining permission to see Soviet helicopters? After waiting four days, I was finally interviewed by Mr. Mihailov, director of research and development of the Central State Committee of the Communist Party, and after a three-hour interview he advised me, through my interpreter, that I would be allowed to talk to the helicopter people, to fly in their helicopters, and to visit their plants. Two days later I was told the meeting had been arranged and in the morning we went to the Central Aero Club. I met Mihail Mil, Alexander Yakovlev, Nikolai Kamov, all helicopter designers, and many of their assistants, including four or five young women who were their interpreters and engineering aides. I was also introduced to Lieutenant General Shepilov, who helped considerably in raising the Iron Curtain pulled down by Colonel Aparinof of the Security Police, who felt that most of the questions I asked should not be answered.

Mr. Mil introduced me to his wife, who has been his chief of stress analysis for the last fifteen years. She told me that she and five other assistants did all the stress work on his latest helicopter,

A TECHNICIAN LOOKS AT RUSSIA . . .

the Mi-6. He said that some of the helicopters have aluminium rotor blades of the Sikorsky type, but that these blades are mainly experimental. On all of his helicopters the rotors and blades are designed and tested for a minimum of 1,000 hours' life. The rotor blades on his aircraft and on the Yak-24 are of round tapered steel-spar construction with built-up metal airfoil section. They are not individually balanced, even at overhaul, unless they need repair or an individual replacement in the set.

Do you recall any more of Mr. Mil's observations? Mr. Mil said the helicopter must be made more economical. He said in the United States the performance must also be increased due to competitive transportation by auto, train, and bus, but that in Russia performance is not as important as there are few roads and no competition in this respect. Mr. Mil said that an attempt would be made to beat the world's helicopter speed record within the next two or three months. He said that within the last year an aerodynamic breakthrough has made it possible to increase the speed of the Mi-6 up to 217 miles per hour. [The Mi-6 recently averaged about 168 m.p.h. over a triangular course.—Ed.]

Mr. Mil said the gross weight was 71,000 pounds on the Mi-6, and the weight empty, depending on the equipment, was approximately 45,000 pounds. The Mi-6 can carry 80 passengers. The rotor head on the Mi-6 looked considerably smaller and lighter than anticipated for such a large aircraft, and Mr. Mil mentioned that his design allowed him this benefit. The major reason for lightness was the fact that he considered an 18-inch center of gravity travel as adequate for this aircraft. His comment was that it is so easy to load the weight correctly with this size aircraft and gain the large rotor weight decrease and blade life increase by so doing. Mr. Yakovlev, who was there, argued quite vehemently that this was not so, that a large center of gravity travel was necessary, and commented that his Yak-24 had 40 inches of center of gravity travel. Mr. Mil discounted this, so there remained a complete disagreement between the two designers.

Do the Russians plan to build an even larger helicopter than the Mi-6? Mr. Mil said that the Mi-6 is large enough and that there was no need for a larger one at this time. He also said that the Mi-6 is in production and will go into service in about a year.

What did you learn of other Soviet helicopters? The Yak-24 was also discussed. It has two 65-foot-diameter rotors which are the same ones used on the Mi-4, and also employs two 1,750 h.p. Ivchenko piston engines, the same engine used in the Mi-4. This was a major reason for the rapid development of this model. The transmissions were also basically from the same aircraft and required a minimum of development and modification. The diameter is to be increased by approximately 10 feet and the fuselage is to be extended. This will allow greater passenger capacity. The goal is 40 passengers for short-haul airline work and larger volume internal cargo capacity for both military and commercial use. The vibration level in the aircraft was considered by Mr. Yakovlev to be completely acceptable. The pilot and co-pilot stations are widely spaced with individual T-shaped instrument consoles. The visibility was excellent. The maximum placarded speed on this aircraft was 157 m.p.h. Cruising speed was 126 m.p.h.

This model has had extensive military usage. Single-point suspension cargo hook carrying has been successfully developed and trucks up to five tons have been flown. The aircraft has been used for Cinerama photography. The rear loading and unloading ramp is power-operated and lends greatly to the aircraft's utility.

The Mi-4 is a very successful single-rotor design. According to Mr. Mil, the range is 300 miles, which is a standard requirement for all their larger helicopters. This stems from the average distance to be flown between fuel or supply bases. The troop or high-density passenger capacity is 16 to 20.

Which helicopters did you fly? I first flew the Mi-4. When I climbed into the cockpit, I looked in vain for the safety belt, but the pilot said this was a safe aircraft and safety belts weren't necessary. Our takeoff was smooth and we picked up to about 100 to 110 miles per hour. I flew the helicopter through gentle maneuvers. At 132 m.p.h. roughness increased slightly, but the flight was mostly smooth and felt very secure. The engine was governor-controlled and made flying very easy. I also flew in the cabin which was quiet (about 90 decibels). Conversation was easy and the vibration level especially low.

I next stepped into the Kamov-15, which is equipped with a propane gas starter and starts almost instantaneously. The control is direct manual without power boost and is very comfortable. We took off at about 1,800 feet per minute rate of climb and ascended vertically to about 1,000 feet. The pilot immediately began to do acrobatics, including tight spirals, inverted flight and vertical stall maneuvers which produced such a violent blade motion and blade stall condition that it was quite evident the pilot was *over-demonstrating*. A quiet moment arrived and I finally took over the controls and felt reasonably secure.

How did the ship handle? The ship handled well and flew absolutely level up to 100 miles per hour and was almost completely free of any vibration except for random shakes. The descent was relatively smooth and the transition to hovering was not noticeable. The Kamov-15 is in quantity production, and is used for crop spraying and has excellent accessory equipment for this job. It is also being used on icebreakers, for some types of sonar work, and for mail and charter service in inaccessible areas.

The helicopter people mentioned that helicopter-airline connecting service was rapidly taking hold and that recently on the Adler-Sochi run to the Black Sea, 2,000 passengers were carried by the Mi-4 in a one-week period.

Team-work in the Industry

Although you were not permitted to visit helicopter plants, were you able to gain some knowledge of their engineering and production methods? Yes. From the conferences that were attended by Mil, Kamov, Archangelsky, Yakovlev, and their staffs, it was evident that the majority, or possibly all of the aircraft industry was a closely integrated team. It was indicated they all worked in one research and development building in Moscow, and, as each project was approved, a suitable design team would be picked. The basic design teams were implemented by draftsmen and engineering aides, but usually comprised 30 to 40 top designers and engineers who also did the detail design work.

Although there were three types—the tandem rotor, single rotor, and contra-rotating type—they all seemed to be totally familiar with each other's problems, and from the conversation it was evident that at times they worked on the same project team. After the design was completed, it was then farmed out to aircraft plants which had full responsibility for the construction and flight development of the aircraft.

They considered the gyrodyne type as unnecessary to realize higher cruising speeds of somewhat over 200 m.p.h., and that the helicopter was fully capable of this without the complexities of control and mechanical complication of the compound helicopter.

As a result of their past experience, they have become extremely safety-conscious and stated that none of their helicopters is released to service unless all components are capable of 1,000 hours' minimum life expectancy.

What were their views on vertical takeoff and landing (VTOL) aircraft? They said they had worked on many VTOL configurations; that their experience has been similar to ours; that they all fly. But they said the helicopter would be the final true VTOL and would be supplemented by STOL types for operation in unprepared areas and for short-field operation.

In the airplane field, comments seemed to be that, as a result of service test and flight operation, turboprops are the most economical type of transport for subsonic speeds, and that jets will take the lead in the supersonic area. Mr. Yakovlev and Andrei Tupolev both indicated that they are presently building a Mach 2 transport.

A Ka-18—enlarged version of the Ka-15 flown by the author

ACROSS THE ATLANTIC BY APACHE

By MAX KARANT

THE author of this article is well known on both sides of the Atlantic. He is vice-president of the U.S. Aircraft Owners and Pilots Association, and this well-told account of his solo flight across the Atlantic originally appeared in "The A.O.P.A. Pilot," that body's magazine. We reproduce but because it was so nearly commonplace. Thanks to eased restrictions it here (in abridged form) not because this flight was in any way an epic, on the import of U.S. light aircraft and radio equipment, British private pilots may soon be able to attempt for themselves flights of a similar nature, but meanwhile, the comparisons to be drawn are obvious.

I HAD discussed with Max Conrad my interest in flying a private plane across the Atlantic. That's his profession, and he occasionally has two planes to be ferried at the same time. So I told him I'd like to take a twin across whenever he had one "left over," and that I'd do it for him just for my expenses.

It was Max's record-breaking Casablanca - Los Angeles flight in his Comanche that finally was responsible for my trans-Atlantic flight. A couple of abortive attempts to break a record had upset his schedule badly, and he ended up in Casablanca many days late—with a new Apache sitting in Lock Haven that had to be in Paris. With just a few day's warning I had to see that the airplane was properly equipped, shaken down, the red tape completed, then flown to Paris. I'd at least expected to have Max around so I could get his guidance for my first such flight, but he was halfway around the world. So I was pretty much on my own. But when they realized my plight everyone pitched in to help with whatever part of the preparations they were familiar. Piper, Lock Haven Airmotive and Wiggins Airways at Norwood, Mass, were responsible for the success of my flight.

This was a ferry flight, and a good deal more complicated than it would be if I were just flying my own airplane to Europe on business. The airplane itself, and all its equipment, were strange. I hadn't flown an Apache for a year or more, so I had to once again become thoroughly familiar with the airplane—along with everything else. As a matter of fact, I was still reading operating manuals for the airplane, engines and radio in the Azores. Add to this the installation and checking of the special fuel tanks, a makeshift temporary installation of a Sunair high-frequency radio, and you can see why the actual long-range hops across the ocean gave me some much-needed relaxation.

Pan Avion of Miami had shipped up one of their new three-man life rafts and survival kits for me to use, and I got it, and a Mae West I'd also requested, by express at Boston. Then I did some local flying, trying every piece of equipment in the plane, its fuel system and checking its fuel consumption. I did everything I could think of to bring about any failures, if there were to be any. Instead, Apache N4010P was in about as perfect condition as I've ever seen a newly-delivered airplane, particularly with all the extra and makeshift equipment it had. And it stayed that way; everything worked normally throughout the entire flight, in spite of my overactive imagination.

I landed at Norwood (a Boston suburb) on Friday, May 29,

Topping-up the Apache. At the door, Max Karant

just a few minutes before the U.S. Customs House in downtown Boston closed for the Memorial Day weekend. Not long after, I discovered that it would be illegal to leave the United States without getting the export certificate validated at the Customs House. A pilot had done just that not long before me, flying an Apache, not realizing that he'd ignored some vital chunk of U.S. red tape. The Government people were in no mood to have anyone else do the same thing, as Alex Muller of the Jonas Aircraft and Arms Co., Piper's export agents, warned me repeatedly.

The fact that One Zero Papa was destined for the Paris show was a fortunate circumstance for me. It had an A.R.C.210 V.H.F. communications set, an A.R.C. A.D.F., Narco Mark V omni and V.H.F. communications set and a Narco marker-beacon receiver. This was the permanently-installed equipment. In addition I had Max Conrad's portable Sunair high-frequency communications set and a hand-operated reel and antenna temporarily installed. The airplane also had Piper's AutoControl, which is an aileron autopilot made by Mitchell; this little device, which also has a heading lock attachment on the directional gyro, proved to be the most useful labour-saving device of all.

Bright and early Monday morning, June 1, I flew from Norwood to Boston's Logan Field. At the airport I checked the Boston - Gander weather (it was fine), jumped in the plane and took off straight out to sea for Yarmouth, Nova Scotia. I'd put 25 gallons in each fuselage tank, to enable me to fly non-stop to Gander. That gave me 158 gallons on take-off from Logan, enough for more than 11 hours. It actually took 0550 hr, flying by way of Yarmouth, Halifax, Sydney, then direct to Gander. Groundspeed was 156 m.p.h.

Throughout the entire flight I used the 55 per cent power settings on the Piper-Lycoming charts and, although I never did get an accurate fuel consumption measurement, I estimate I averaged less than 14 gal/hr—although I did all my flight planning on the basis of 15 gal/hr. In any case, I estimate I could have flown nearly the entire way back to Boston with the gas I had left when I landed at Gander.

As soon as I landed I ordered all fuel tanks filled, the first time One Zero Papa would carry her full 268 gallons. She took 156 gallons, so I'd had 112 gallons when I landed.

It was at Gander where I had my first contact with trans-Atlantic weather forecasting and flight planning. Even though I knew a lot of weather information is available from the Atlantic, I didn't realize how much until I got the first of several briefings at Gander. Largely because of the many airplanes constantly over the ocean, these oceanic weather people are able to almost literally locate specific clouds for you.

First thing in the morning I taxied across the field, parked the plane and started the red tape and paperwork preparatory to takeoff. A quick check of the weather showed me immediately that my planned route to Shannon, Ireland, was out of the question. Airline and military planes had sent in dozens of reports on a front lying between Gander and Shannon, with heavy icing and turbulence at all altitudes. That washed out the route for me because One Zero Papa had no deicers and, in that heavily-loaded condition, I had no intention of getting into turbulence.

So with the help of Sy Cohen, a Flying Tiger Line navigator I met at Gander, I had to lay out the only alternate left to me: via the Azores, something I'd never even considered, nor was I prepared for. My friend dug up an old copy of an aircraft position chart, and helped me lay out the course normally flown to the Azores, then on to Paris.

Meanwhile, another front was rapidly moving in on Gander from the west, so I had something else to worry about. By the time I'd finally laid out the course, filed a flight plan, then completed all the paperwork connected with landing fees, Canadian Customs, and the like, it was past noon local time. That gave me something else to worry about, because that meant I'd have quite a bit of night flying ahead of me, and would arrive in the Azores in the middle of the night. But I had no alternative, because the weather would get worse here rather than better.

So my first takeoff with fully loaded fuel tanks, plus everything else I had to carry (disconnected back seats, baggage, survival gear and miscellaneous bits and pieces) was made into a 40 m.p.h. gusty wind, a 1,500 foot ceiling, and rain. It was here that I

One Zero Papa's cabin: behind the seat, two 80 gal tanks

The Atlantic by Apache . . .

experienced perhaps the greatest apprehension of the entire flight. I was on instruments within moments after takeoff, and stayed on them for nearly four hours.

The takeoff itself startled me—not because it took so long getting that load off, but because the Apache's performance actually took me by surprise. Though fully prepared for a long, ticklish takeoff run, One Zero Papa almost leaped into the air within a few seconds after I opened the throttles.

As soon as I went on instruments near Gander I realized that I was probably facing the actual front I'd been hoping to beat out. I switched to a military radar station at St. Johns, and they confirmed my fears; the front lay right across my track. And because my course was based entirely on dead reckoning I felt I had to stick close to the headings I'd plotted on the new "Slide Graphic" computer the Jeppesen company had loaned me. So into the front I went. Heavy rain, quite a bit of turbulence—and then another worry: the thermometer outside slowly dropped to 33 deg. I didn't think the ship would carry much ice in its present condition and at 7,000ft, my assigned altitude. I really sweated blood, watching that thermometer. For more than an hour it hovered between 32.5 and 33. I suspect that if it had hit 32 I would have dumped my fuselage fuel and turned back.

But it didn't, and after about two hours the rain died down and the clouds I was in began to look a little lighter. Suddenly I broke out of a solid wall of clouds into the clear, now on top of a deck of broken clouds. And the first thing I could recognize through a hole in the clouds below was an iceberg. But from that point on, the weather began improving just as the forecaster said it would; I was flying directly into the centre of a high. Now I settled back and relaxed, letting the AutoControl do all the flying. After a while I began tuning around on the A.D.F. for the radio beacon of Weather Ship "Delta," 750 miles at sea. I was still nearly 300 miles from the ship when I suddenly found its beacon, loud and clear. I tried calling them a few times on the Sunair, but found the operation of the antenna reel to be too difficult. Finally I resorted to the system I used from that point on: I called other aircraft on 121.5 Mc/s. This worked so well I used it throughout the rest of the flight. I was never out of contact with at least one airline or military transport. With their automatic high-frequency radios they were easily able to relay position reports for me to one shore or the other.

Soon I was talking with "Delta" on V.H.F. She was the U.S. coastguard cutter *Ingham*, and she'd been keeping her beacon on for me 100 per cent of the time; I'd asked the boys at Gander to ask them to keep it on. They picked me up on their radar, plotted my position, then vectored me out on the course to the Azores which I gave them. I passed "Delta" 0441 hr out of Gander. Within an hour I was flying in the dark.

It was a beautiful starlit night and One Zero Papa was operating like a dream. After a while I began thinking about the weather I might find in the Azores, because I had no instrument approach charts. All I had for this route was the U.S. Air Force's radio facilities book for the Atlantic and Europe. But I'd already made up my mind that, if the weather was at all bad, I'd call the G.C.A. unit at Lajes, the U.S. Air Force base in the Azores, and ask them to talk me down.

Once again I called on 121.5. Out of the night came a clear voice answering me and identifying himself as Pan American's Flight 103—A Boeing 707 jet at 31,000ft, out of Santa Maria for Idlewild. I asked him about Santa Maria's present weather, then asked if he could relay my position to Santa Maria and get their terminal forecast. I told him I'd had to switch routes at the last minute, and didn't have an approach chart for Santa Maria. He called back in a few moments, gave me a good forecast for Santa Maria, then asked me to stand by to copy down the pertinent parts of his approach chart for Santa Maria. I must admit I was a bit impressed by the drama of a jet transport at 31,000ft over the mid-Atlantic reading off headings and frequencies to me down there at 7,000ft, while I copied them under a cabin dome light.

Soon I was receiving radio beacons in the Azores, then the omni at Lajes A.F.B. Then I turned down the Azores chain to Santa Maria 125 miles away. I must admit I was thrilled to see the airport's rotating beacon and lighted runway. My wheels touched at 0327Z, 1106 hr from Gander for a block to block speed of 150 m.p.h. I had about eight hours of fuel left.

My takeoff from Santa Maria was in the early morning, because I wanted to arrive in Paris in daylight. The weather was calm and lovely, and the takeoff was uneventful. I'd decided to take the shortest route to land, flying direct to a powerful Consol radio beacon at Lugo, Spain, then direct to Paris.

The forecaster drew out my expected weather, and indicated an area of bad weather, with ice and turbulence, not far off the Spanish coast, directly on my course to Lugo. And sure enough, within moments of my estimated arrival over that part of the ocean, there was the weather. I stayed in it for a while, at my assigned altitude of 9,000ft—but this time I got ice and plenty of it. The only reason I tried out this weather as long as I did was that I had been out of Santa Maria about 0620 hr, and thus had burned off some 530 lb of fuel. Nevertheless, it got worse—and then, at the worst possible moment, someone shut off the Lugo beacon. That did it. There are mountains not far behind Lugo along the north Spanish coast, and I had no intention of blindly holding a heading toward them, on instruments, with no radio aid. I turned out toward the Bay of Biscay.

Soon I broke out of the bad weather into the clear, on top of a solid cloud deck. By now I was not on my plotted course, and I had no radio aid of any kind that I could rely on. Experienced American pilots told me later that French radio aids—especially homing beacons—are not much good until you're almost on top of them. But I didn't know that then. After about an hour of just holding a compass course I saw a break in the clouds ahead and below, and there got my first sight of land, an island covered with farms. I had no detailed charts of this part of the world, so I couldn't identify my position. And, after tuning the A.D.F. almost constantly and getting nothing at all, I began to worry. I began circling, looking at that island. After a couple of circles I suddenly realized I was doing the very thing you must never do when lost. I told myself—out loud—to get the hell back on the course I'd plotted and stick with it. After all, I'd estimated my arrival at Paris at 1814Z and I still had a couple of hours to go.

After another hour or so I tried the A.D.F. again, still getting nothing but an unusable jumble of weak, overlapping stations. Then I began trying the Narco Mark V, because France has a number of omni stations. Suddenly one of them popped up on the dial. I immediately identified it as Poitiers, so I turned southeast, homed on the station, then began calling Bordeaux nearby. Soon they answered on V.H.F. I told them what I was doing and asked them to advise Paris. After a while I arrived over the Poitiers omni. Now, however, the weather began to worsen. I was still at 9,000ft, and on instruments half the time. By the time I got within V.H.F. range of Paris it was raining hard, so I called them. They answered, saying there were so many thunderstorms the controller couldn't even use his radar!

Paris—23 Minutes after E.T.A.

Then I tried to get a clearance down from 9,000ft, so I could try to stay V.F.R. underneath them. He told me I'd be No. 9 "to receive a message." But it was my neck I was worried about, so I kept after him, and he finally cleared me down to 3,000ft. Sure enough, there were lots of thunderstorms everywhere. Finally, after some help from Le Bourget's V.H.F. direction finder, I flew around the back of one and made a hurried landing.

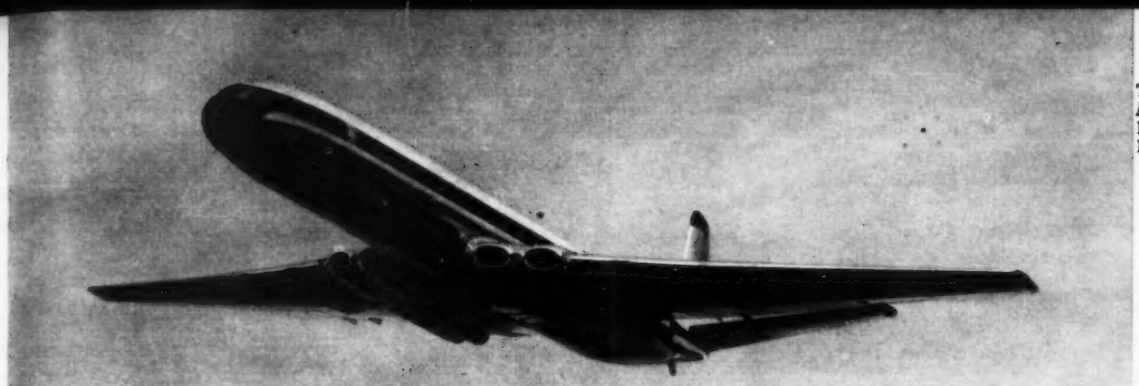
As it turned out, I was only 23 minutes off my estimated time out of the Azores, so I hadn't done as much milling around over the Bay of Biscay as I'd thought. I'd made the 1,670-mile flight in 1147 hr, for an average of 141.

Of the entire 4,778-mile flight from Washington to Paris, the last two hours over France were the most trying. This was due largely to the lack of safe, reliable radio navigation aids in France, at least when compared with radio aids I'd had throughout the rest of the trip. Low-powered homing beacons, with frequencies overlapping each other to the point where the A.D.F. couldn't distinguish between them until you were right on top of them, made the A.D.F. relatively useless. It was the omni system that got me back where I belonged.

Except for this basic problem, which I might not have had if someone had warned me in advance, the trip was pleasant and easy. The only limitations on any pilot making such a trip would be that he should have at least 1,000 hr total time (this, incidentally, is what the insurance company required), an instrument rating, and a reasonably good knowledge of navigation.

Of all the things about this flight that impressed me, perhaps the most impressive was the excellence of the American equipment and facilities. Sure, you always favour what you're most accustomed to. But aside from such partiality, the airplane performed perfectly. The Lycoming engines did even better than the manufacturer claims; I used about three quarts of oil for the entire flight, and fuel consumption was below that on Lycoming's own charts. The radios and instruments functioned perfectly.

As I said in the beginning, anyone (within certain limits) can do this. It's a fascinating and thoroughly enjoyable way to go to Europe, and tour any part of that world you wish. My fuel and oil cost for the entire flight was about $155 [£55].



THE GENTLE JET

"Flight" photograph

IMPRESSIONS OF B.E.A.'s NEW COMETS: 4B CREW TRAINING AND FAMILIARIZATION METHODS

By Capt. G. T. GREENHALGH
M.B.E., M.Inst.T.

The author, who is flight manager of B.E.A.'s Comet Flight, has been flying as an airline pilot since1933. He wishes to emphasize that the views he expresses here are not necessarily those of B.E.A.

EARLY in the spring of 1958 the B.E.A. jungle tom-toms began to beat out the refrain of "Comets." Speculation started to run riot—two Comets, ten Comets, fleets of Comets! And Seniority took the prior place of the three "S's." A month or so later the tom-tom message was confirmed; B.E.A. was to get six Comet 4Bs, a medium-stage, faster version of the Comet 4, with a 6½ft longer fuselage, wing span clipped by 7ft, and no pod tanks.

The delivery date of January 1960 seemed a long time away, and quite a few people thought they would have little to do but contain themselves in patience for many months. This could not have been further from the truth. As soon as the acquisition of Comets was confirmed the writer was appointed flight manager "designate" Comets, with Captain J. Munro as assistant flight manager. Our brief was basically to "find out all you can, from whoever you can, about jets in general and Comets in particular." A pretty all-embracing job.

It so happened that the first aircraft I ever flew, both as an *ab initio* pilot and on commercial service, were both de Havilland products, so I was eager to see what the latest type was like and whether there were any family characteristics.

The flying baptism had to be delayed, and meanwhile much water passed under various bridges whilst the pursuit of jet knowhow went on. Talks were held with the B.O.A.C. Comet captains and with the captains of No. 216 Squadron's Comet 2s at Lyneham, and also with their flight planning and navigating experts. In each case all their knowledge was freely put at our disposal, and though at no time had we underestimated the difficulties of operating jets on comparatively short-haul routes it began to look as if the job ahead was even bigger than we had expected.

The first major problem appeared to be the usual short-haul one of time. How rapidly could the crew do the checks, the flight planning, and the rest of the routine drills before departure? The biggest snag was the flight planning, for on the long sectors flown by both B.O.A.C. and 216 Sqn. the average time was 45 minutes. This obviously would not do for short-haul, multi-sector operations, where something on the lines of our Viscount flight planning tables was vitally necessary; but we needed more than theory before we could be sure it would work. There was also the fuel question, another vital factor in jet operations. We already knew the details of the graphical "howgozit" used by B.O.A.C. and 216 Sqn., so to check the operation in the air several B.E.A. captains flew with B.O.A.C. on their London - Beirut - London engine-proving flights in the Comet 2E. They returned duly impressed, although I personally felt there was a snag somewhere—it all looked too easy! A highly trained and experienced crew always makes the most difficult job look simple. However, a considerable amount of very useful information was obtained and our appetites were whetted for more.

By the end of summer 1958 eight base and line training captains for the Comets had been selected and in December ten captains and two ground instructors reported for a two-month Comet flight engineer's course at Hatfield.

Delving into the intricacies of modern powered controls, electrics and so forth spread more than a little alarm which only gradually evaporated as light began to dawn with greater knowledge. There were diversions from study for some of the group who travelled daily to and from Hatfield, in the shape of fog encounters in country lanes with dust-carts and buses; as a result, some captains formed the opinion that it was a lot less dangerous to fly on the line, fog or no fog.

At the end of January 1959 the classroom became airborne in the shape of G-ANLO, the de Havilland workhorse, a Comet 3B which now had clipped wings and Avon 525 engines with reverse thrust. The details flown were the usual ones of circuits and bumps, stalls and initiation into high-speed Mach runs. Being pressurized to only 2½ lb it was a most uncomfortable aircraft to fly in, as everybody had to be on oxygen when not in the circuit. My idea of torture is to wear a new oxygen mask for over 30 minutes.

The first impressions of flying this aircraft were of opening the throttles, of nothing much happening, of thinking it would never get off at this rate . . . then around 65 kt getting a hefty kick in the pants, V_1, V_R and V_2 suddenly arriving (apparently all together), frantically pulling back on the pole as 125 kt came up, and going on pulling back to keep the speed down to the climbing speed of 150 kt—the "deck" rapidly rocketing away and the Comet seemingly standing on its tail. Horrible thoughts of stalling crossed my mind, but as the wheels were now up and the A.S.I. was winding its way past the 200 kt mark I relaxed somewhat and mentally took off my hat to the Hunter bods, who no doubt disappear twice as quickly.

Pretty soon things fell into place and we "bashed the circuit" until landings became landings and not arrivals, day or night.

On our return to L.A.P. the team split up and for the summer went back to their parent flights, wishing that 1960 was here, already sold on the Comet, and knowing the 4B would be bigger and better.

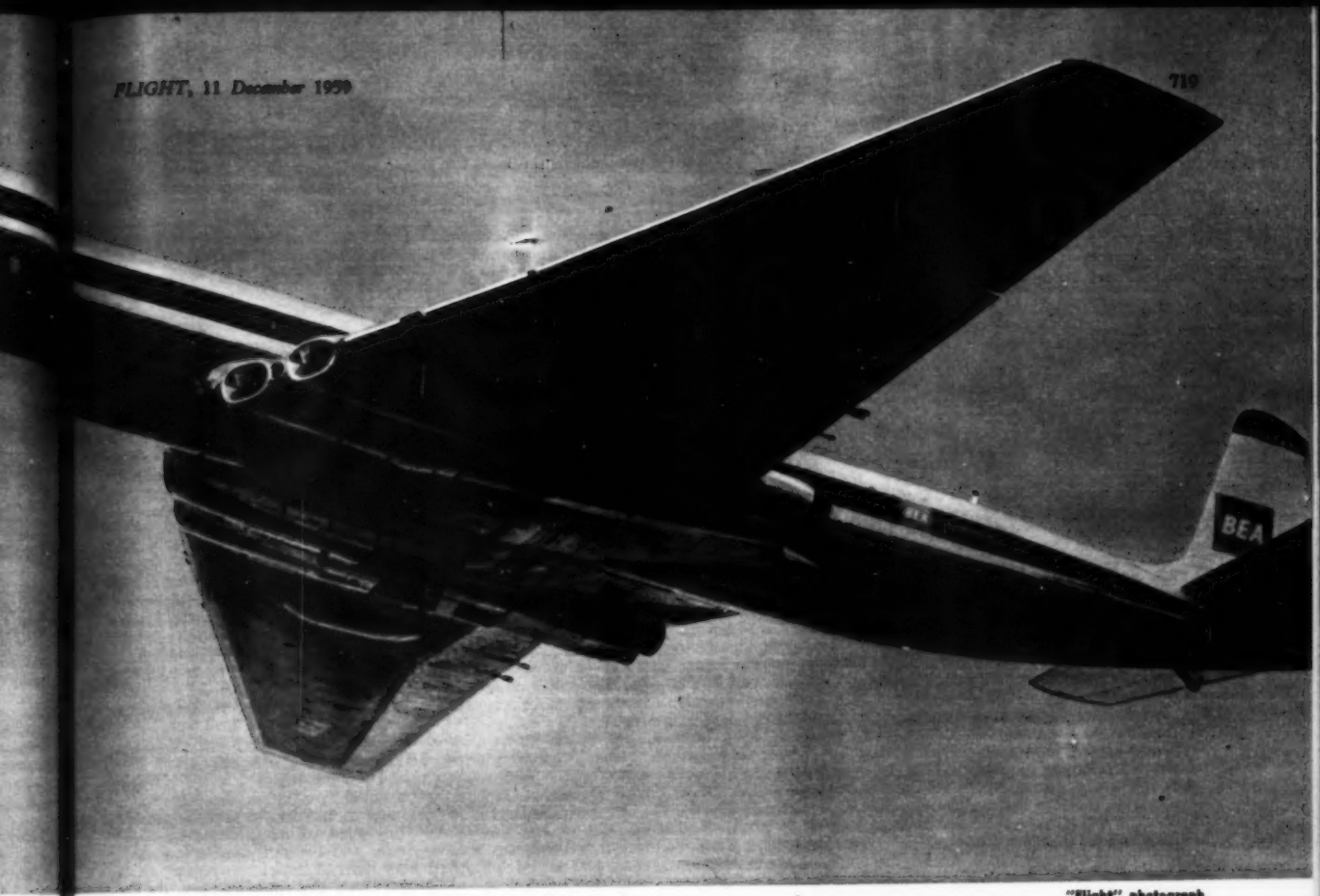
Meanwhile talks were going on regarding the possibility of hiring the Comet 2E from B.O.A.C., who had finished their engine proving flights, and using that aircraft to gain operating experience during the summer. Unfortunately that idea fell through, but our previous contacts with 216 Sqn. bore fruit in the shape of permission to fly with them during their Singapore and African flights on their Comet 2s. Every B.E.A. Comet captain flew at least one trip with them and gained much invaluable information on snags, weather and operating techniques; and many hints and tips were exchanged. It is our unanimous opinion that 216 deserve great credit for the way they operate, and the regularity they achieve over very long routes; quite a few airlines would be pleased to equal their performance.

One of the interesting snags we experienced during these flights was the freezing or blocking up of the Machmeter pitot lines after flying for over an hour in cirrus at 40,000ft. The meter usually goes "off the clock" and Mach auto-trim operates; and unless you have calculated, and know, the equivalent air speed you are in the delightful position of having to decide rapidly which instrument is wrong, and at that height and speed a wrong decision means trouble, either exceeding the M_{NE} with the resulting increasing

(*Continued on page 720, after two pages of Comet 4B photographs*)

The Gentle Jet . . .

Aspects of the de Havilland Comet 4B (four Rolls-Royce Avon turbojets, each of 10,500 lb thrust) as now entering service with British European Airways. This aircraft is the subject of a captain's appraisal in adjacent pages



"Flight" photograph

B.E.A.'s Comet 4B simulator at Heston is playing an important part in training crews. In the cockpit here, under the watchful eye of the training captain, Capt. A. R. Martin, are Capt. N. C. Green, Comet Flight (left), and Capt. C. Owens, assistant flight manager, Comet Flight

"Flight" photograph

THE GENTLE JET . . .

nose-down trim, or a stall. The immediate answer is to set the aircraft attitude on the Zero Reader and when what seems to be the inevitable happens, fly the attitude until the suspect instrument has been identified. Further experience was gained in the use of weather radar (otherwise known as "cloud and clonk"), both in avoiding cu-nim and in mapping.

Altogether a very worthwhile exercise, appreciated by both sides and leaving one with a feeling that 216 Squadron's light had been hidden by too large a bushel.

B.O.A.C. were themselves heavily involved at this time in Comet crew training but nevertheless afforded our captains the opportunity of flying on their training details to study their methods and techniques; this experience, together with that which we had learnt from 216 Sqn. enabled us to draw up a tentative training scheme as far as drills, flying syllabus and time required for ground courses were concerned.

Meanwhile the big question of time required for flight planning was being given urgent attention; 45 minutes per flight-plan was definitely out, and the solution was found by "Bill" Bailey, our senior navigation instructor, who devised a set of tables (based on our Viscount ones) which produced the answer to such questions as "elapsed time and fuel required to destination and chosen diversion airfield?" in less than ten minutes. It only remained to check if these tables worked in practice.

The first Comet 4B had been flying for a few weeks when it was decided to demonstrate the aircraft in Athens, and I went on the flight, complete with the tables, as second pilot to G/C. John Cunningham. The flight planning was done by the use of the normal de Havilland tables, but a second plan was made using the B.E.A. tables, which at that time were based on Comet 4 performance figures. The B.E.A. flight plan was completed in a little over ten minutes, and although we did not fly at the B.E.A. height throughout we decided we were on the right track as the error in time was only three minutes and the fuel error 750 kg.

Test flying by de Havillands continued and the final selections of Comet crews were made, details of courses finalized, and the dates fixed on the basis of contract delivery dates. No sooner had this been done than a large spanner was thrown into the works by the news that delivery would be two months ahead of schedule date. A more or less unprecedented situation! Courses had to be reshaped and brought forward to avoid the embarrassing situation of aircraft sitting on the ground through lack of crews.

Fortunately the Comet simulator was more or less on schedule and should be working before the first aircraft arrived, to enable the training captains to organize their techniques and drills, prove or disprove them, and reorganize where necessary.

Four of the original ten captains, Atkins, McKeown, Wilson and myself, had been flying with de Havilland pilots during the testing period, either as second pilot or observer and collecting information on handling and performance, and generally familiarizing ourselves on the differences between the 4B and the old 3B.

The end of September saw the nucleus of training captains back in school for a revision of the aircraft's technical details and the second half of "the A.R.B." This hurdle over, Captains Atkins (assistant flight manager, training), McKeown (senior line training captain), Wilson (senior base training captain) and myself returned to Hatfield for more flying and circuit-bashing on the 4B prior to the acceptance flights and beginning of training proper.

At this period de Havillands were having a spot of bother with the stalling characteristics of the 4B, which was not behaving in a ladylike manner. The pre-stalling buffet was pretty hefty and up front the aircraft shook like a rat in the teeth of a terrier, a most uncomfortable feeling. This situation was eventually resolved by moving the boundary fence about four feet inboard and reducing the size of the spoiler on the leading edge. Ladylike manners then appeared, the buffet was less marked, and when the nose dropped the classic stall took place; in some conditions the wing would drop, but recovery was possible on aileron.

The type acceptance flights were most interesting and fully came up to expectations. These flights started with the aircraft G-APMA loaded to the forward c.g. limits and at the maximum take-off weight of 71,650 kg the V_2 (take off) speed was 143 kt, the V_R (stick rotation) being 10 kt lower. This V_R speed is primarily to ensure that the aircraft is lifted off the runway at the correct unstick speed and therefore does not use up concrete through being held down longer than necessary, thus conforming to the calculated take-off distance. In this case the 4B was airborne in an estimated 1,500 yd, climbing initially at 150 kt I.A.S. to meet the noise requirements; power was reduced to climb power at 2,000ft (which is normally attained at rather less than 3,000 yd from take-off point); speed allowed to build up to 290 kt I.A.S. up to 6,000ft (290 kt I.A.S. being "bird collision" speed); and flaps retracted at 1,500ft and approximately 170-180 kt I.A.S. Speed is then allowed to increase to 330 kt or Mach 0.76 for the rest of the climb, the Mach number taking over, so to speak, from the I.A.S. at around 24,000ft. Climb to 30,000ft takes 16 min.

On this flight we climbed to 38,000ft and checked the handling at high Mach numbers. The limiting M_{NE} for the 4B is 0.79 and if this speed is approached a horn blows and up elevator trim is automatically applied at the critical figure.

Earlier Comets had a tendency to nose-down trim at around M 0.79-0.8 and any increase in speed increased the nose-down tendency—rather a vicious circle; and the pull out, unless done early and gently, produced very marked buffet on the tail. It is necessary, therefore, to demonstrate this phenomenon during training. Actually, whether it is due to the longer fuselage or the shorter wings I don't know, but it is difficult to demonstrate this on the 4B; unless the aircraft is flown to around M 0.86, the nose-down tendency is hardly noticeable and no buffet is experienced unless g is applied by rather coarse elevator movements. If, however, the aircraft is allowed to run away from you the drill is to extend the dive brakes and throttle back, the brakes giving a slight nose-up trim and the speed being brought back into range.

Descents and Landings

Next on the list was an emergency descent, and this has to be seen to be believed. With throttles back to "flight idle" and dive brakes out the aircraft dives to 350 kt I.A.S. M 0.77. You appear to be going down nearly vertically; the rate of descent is around 10,000ft/min and a lot of pressure is needed on the stick to get the I.A.S. Once 350 kt is attained care is needed (if the aircraft is trimmed to that speed) to avoid exceeding it, and care is also needed on the recovery to avoid excessive g. Personally I feel a compromise of 330 kt I.A.S. is more desirable. The rate of descent is then in the order of 8,000ft/min, and there is a tolerance if this speed is exceeded, and the extra time on the descent after a pressurization failure would be negligible.

After these exciting moments rather more mundane checks on flap and trim settings were made. All were very satisfactory and it would seem that the 4B is more stable in all planes than the 4, especially in yaw, probably due to the absence of pod tanks. If yaw is deliberately induced the aircraft will damp itself out in four cycles without the yaw damper and in half a cycle with the damper on. The roll rate can be quite high, as the ailerons are powerful; if a bank to port is followed quickly by one to starboard, and the rudder and aileron movements are not properly co-ordinated, a "fin stall" will result.

The various phases of landing followed, the approach speed and threshold speed varying with aircraft weight. An average approach speed is 130 kt I.A.S. falling to 123 kt I.A.S. at the threshold, this final figure being obtained by lowering 80 deg of flap, the large "barn-door" flaps effectively killing the extra 7 kt. Even so, the Comet is so clean I'm sure it would go on for a very considerable distance without brakes! A typical four-engined 4B circuit and landing procedure is as follows: Turning downwind at 1,000ft, with gear up and 20 deg flap down, 6,500 r.p.m., speed 170/180 kt I.A.S., gear is selected down when level with downwind end of runway and this leg held for a further 40 sec, when the aircraft is turned onto base leg and 40 deg

Experience with B.E.A. Comets so far has shown that provided the pilot in the right-hand seat deals with communications the systems operator has an even share of the workload. Here F/O. A. A. Jarvis, Comet Flight, gets in some time on the new 4B simulator at Heston

"Flight" photograph

flap selected. The gear down and 40 deg flap will reduce the speed (with the same power setting) to around 140/150 kt; on turning "final" this speed is held until it is obvious that you will not undershoot, and 60 deg flap is selected, this selection further reducing the speed to about 130 kt for the approach to the threshold, when 80 deg flap (full) is put down and the threshold speed practically automatically obtained.

The flare-out is really quite easy once you get accustomed to the fact that you are a very long way ahead of the wheels and that though *you* may have crossed the threshold the wheels have not! The nose comes up fairly high and the stick very well back for a smooth landing, the stick is then eased forward when the mainwheels are on and reverse thrust selected by lifting the outer throttles up and back. This produces quite appreciable retardation—a cross between reversing props and ground fine pitch on Viscounts. It also produces the most colossal noise. I feel sure passengers will have to be briefed on what to expect from reverse thrust, as it sounds rather like an express train disappearing into a tunnel, except that here there's no tunnel, though (on wet runways) lots of steam! Reverse thrust is maintained until the aircraft has reached 60 kt, when quiet reigns again.

I stated earlier that the power settings on the approach remained constant; but if landings are made into strong winds these settings have to be altered, and this is done in increments of 200 r.p.m. Similarly the power has to be adjusted according to the aircraft weight, generally speaking up or down 200-400 r.p.m. The Comet is extremely stable speedwise, and once you have the power set correctly and the aircraft trimmed to the desired speed it will stay "in the slot" without your assistance. However, if you start moving in the rolling plane by over-use of aileron the Dutch-roll characteristic of swept wings make their presence felt. Continued use of aileron only makes matters worse until finally the aircraft is rolling about like a ship in a gale. The answer is to hold the ailerons neutral and let the aircraft damp itself out.

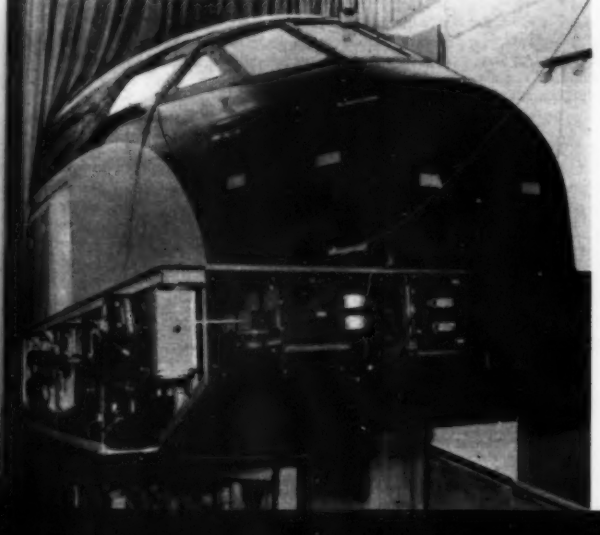
Post-delivery Experience

Overshoots from low threshold heights present no problems either on two or three engines and on all four engines the aircraft goes away like a rocket; the climb away can be initiated almost immediately. The Avon 525 accelerates from flight idling r.p.m. (4,600) to take-off power (8,050 r.p.m.) in 4 sec, and on a two-engine overshoot it is necessary only to hold the aircraft level for 3-4 sec before climbing away—provided the speed is correct; if too slow, it may take up to 20 sec to build up. The asymmetric thrust can be held easily on rudder alone without trimming and the foot load is very low; I would estimate that anybody could fly the aircraft with two engines out on one side for a good 30 min without trimming, and not be the least leg-weary.

After all the reports one had read in aviation magazines, and the advice given at the I.A.T.A. Conference at San Francisco last May about flying techniques on some other jet airliners, one approached the Comet initially with some awe and the respect due to a "hot ship." The respect for a good aeroplane is still there, but the awe has gone. The Comet 4B is a very gentle jet by any yardstick. It may be a slightly hotter ship than the 4, because of its clipped wings and slightly higher approach speeds, but nevertheless, it is a beautiful aeroplane to look at and to fly. Undoubtedly it will bite if allowed to, as will any aeroplane, but not nearly so viciously as some other jets. It is interesting to note that the amount of sweepback on the wings is roughly equal to that of a DC-3.

This exterior view of the 4B simulator shows part of the moving-base mechanism. It was built by the Air Trainers Link Division of General Precision Systems and is installed at Heston

"Flight" photograph



Our first aircraft was delivered on November 9 and was immediately flown to Stansted, where base training was to be carried out. The initial seven training captains, together with Peter Wilson of de Havillands, then started circuit and bumps, etc., to check the procedures and techniques already worked out on the simulator, which had been in full blast for a fortnight previously. It is amazing how many things one needs to revise and alter on drill cards and so forth once you get on to the actual aeroplane in earnest. However, alterations were made; issues 1, 2 and 3 of drill cards made their appearance rapidly and, with an average of six hours' flying a day being carried out the aircraft rapidly shook down. In 14 days over 80 hours had been flown and over 320 landings made, all on one set of tyres, which (and with no unserviceability of the aircraft or engines) we believe is something of a record.

Due to the new Ministry of Aviation requirements regarding instructors' qualifications before being allowed to sign the "1179" form (landings and take-offs, etc., for a new type-licence rating for the rest of the Comet pilots), it was necessary to do some actual route flights to enable the first three senior training captains to get the necessary time in command, as first officer and on the systems panel; so a six-day programme of flights across Europe and the Middle East was arranged. This was not only aimed at getting in the previously mentioned hours, but also to check the route operating procedures, fuel consumptions, and so on, together with the division of crew duties so that the cockpit load was equally divided. Inevitably, at this time of the year, the programme came unstuck on the first day. Fog over Scandinavia and Germany caused re-routeing and instead of visiting Oslo, Stockholm and Copenhagen we re-routed Copenhagen/Nice/Stansted. The sector Copenhagen/Nice was flown in 2 hr 6 min and Nice/London in 2 hr 5 min. This latter slow time was achieved because the 4B caught up a Boeing 707 across France and we were held at 31,000ft by London to obtain the necessary separation before commencing our descent into Stansted.

An interesting point emerged from these flights, in that initially we had thought that the systems panel would seem to be the most exacting duty point in the cockpit, whereas in fact it proved to be quite simple and straightforward provided the pilot occupying the position was not asked to do anything else, such as passing messages on H.F. or getting the weather reports. A further point was that the pilot flying the let-down pattern needs to be relieved of all other duties, such as R/T. communications and reselecting V.H.F. frequencies, if strict adherence to speed, height and pattern is to be maintained. These duties can easily be done by the second pilot and this sequence will undoubtedly be used on service.

Quite a few "firsts" were made on these flights—e.g., first pure-jet airliner into Tel Aviv—and no doubt a number of "record" times were made. Other experiences included a cu-nim at 34,000ft when accelerations of +1g to −1.2g were recorded on the accelerometer! Actually, the captain having reduced speed to 270 kt I.A.S. the Comet behaved very well indeed, though the sound of hail on the windscreen could be heard in the cabin. This little lot had shown up on the weather radar but (being charitable to the "cloud and clonk") had apparently not been interpreted correctly.

[*Continued overleaf*

By today, this scene will have been repeated during the course of route-proving flights at almost a score of airfields on B.E.A.'s routes. Regular Comet services start on April 1 to Warsaw and Moscow. An article on the Corporation's commercial plans for the Comet 4B appeared in "Flight" for November 6

THE GENTLE JET . . .

Everywhere it went, although its arrival was unheralded and unsung, the aircraft attracted interest; it is possible that some of the difficulty experienced in achieving our scheduled turn-round and transit times was due to persuading people to go away. The flights also gave the four pilots an opportunity to find out in practice just how long one can fly a Comet in Europe per day without loss of operating efficiency. That is really the keynote of Comet flying: one must be on the ball all the time; in other aircraft one has odd "slack" periods, but with the Comet's speed, and with European airways and reporting points, such spells are now non-existent.

Following on these route-training flights begins the more prosaic business of normal base training of the remaining 80 Comet pilots, all of whom came from Viscount aircraft, and therefore had a basic knowledge of jet engines and of comparatively fast aircraft, plus the Smiths Flight System. Their training will proceed on the following lines. Five weeks' ground course on the engines, airframe, pressurization, and all the bits and pieces of modern power controls, followed by a fortnight on the simulator, which gives them some 40 hours' "flying" divided into periods of first pilot, second pilot and third pilot on the "panel." They then go to Stansted for an average of eight hours' base flying on the aircraft, returning to the simulator for two or three "route flights" before being posted to the Comet Flight for their line training, where they fly ten to twenty sectors with a training captain. We decided to use sectors instead of hours for this training, as hours on a Comet don't mean much; due to the speed, and as the average sector-length chosen for this line training is two hours, the pilots will eventually go on the line with around 70-90 hours on the simulator and aircraft. Obviously, as there appears to be no such animal as a standard pilot, these times will be increased in some cases and decreased in others; but no pilot will be allowed to go "solo" until he has satisfied the particular training captain that he is not only competent to fly the aircraft but also that he fully understands it technically.

The introduction of the Comet into B.E.A. service is yet another milestone in Corporation history. It is our first pure jet and follows some six years after the coming of the Viscount, and is the first stepping stone on the way to the 121, as the Viscount 700 was to the 806. The Comet has an ambitious programme ahead of it, the seven aircraft being scheduled to fly 2,400 hr per year and the fleet to carry around 20 per cent of B.E.A.'s total passenger loads. It is not likely to be flown on the shorter routes, but on the medium and longer runs network such as Oslo, Stockholm, Moscow, Nice, Athens, etc.

On such routes the Comet is estimated to be a profitable aircraft with a load factor above 65 per cent; and with its speed and comparative silence (inside) this load factor should easily be obtained. It will be most interesting to see the results of this fast pure-jet aircraft on the medium/short-haul routes. It is not exactly the ideal aeroplane for the job of quick transits and turn-rounds, as the hold and passenger doors are too small for rapid entry and exit. The training flights showed that transits with refuelling would be very difficult to achieve in 45 min. Nevertheless, all concerned with the operation are eagerly looking forward to the day when the "gentle jet" goes into scheduled service.

PROVING THE COMET 4B

IT certainly was not B.E.A.'s fault that the intensive series of proving flights planned for the past fortnight got off to a delayed start. The first was to have been a return flight to Nice on December 1 and 2—days on which London Airport was almost completely closed by fog, Nice was partly flooded and experiencing the worst gales in living memory, and a strike of French handling staff was threatened. So the programme had to be modified.

The intention was to fly the Comet during this fortnight over every route on which it will be used when services begin in April. On December 3 it was to go via Copenhagen to Moscow to spend two hours in the Russian capital and fly back to Copenhagen for a night stop. The following day a flight was to be made to Warsaw (although the airport was reluctant to give permission) and from there to Stockholm for the next night stop. A proving flight was then to have been made to Oslo before returning to London on Saturday, December 5, prior to a day-off from flying on the Sunday. But just before the proving flights began, it was announced that—as a result of the Caravelle operating into Oslo—aircraft noise was to be debated in the Norwegian Parliament, and to avoid inflaming the situation, it was decided to postpone the Comet's visit. Another Scandinavian country that is becoming sensitive to jet noise is Sweden, and at Stockholm the Comet will have to undergo noise-measurement tests.

The start of the present week should have seen the Comet 4B flying south to Rome, then on to Athens and into Nicosia for the night before going on to Tel Aviv, back to Nicosia and Athens and then in to Istanbul. The schedule for Wednesday morning was to visit Athens for the third time in three days, fly north to Munich and then back to London. Finally, the fortnight is to be concluded with a short trip to Zurich, a night stop, then back to London, and the series will be rounded-off with flights to Frankfurt and Dusseldorf.

Press and travel agents, but no fare-paying passengers, were to be carried on every flight so that the flying would have both a commercial purpose as well as providing line training for the first Comet course. In fact, it was intended to operate the Comet everywhere at full load, any residue of seats being taken by B.E.A. technical and engineering staff who would be checking sound levels and temperatures, instructing handling staff and practising turning round the Comet within the 45 minute target which the Corporation has set.

To achieve this is going to present some problems—not to the crews, who are confident that they can complete their flight planning within the allotted time, but in replenishing with up to 8,000 gal of fuel and loading and unloading 87 passengers, freight and baggage through a limited number of doors. Two refuelling bowsers working together will generally be required.

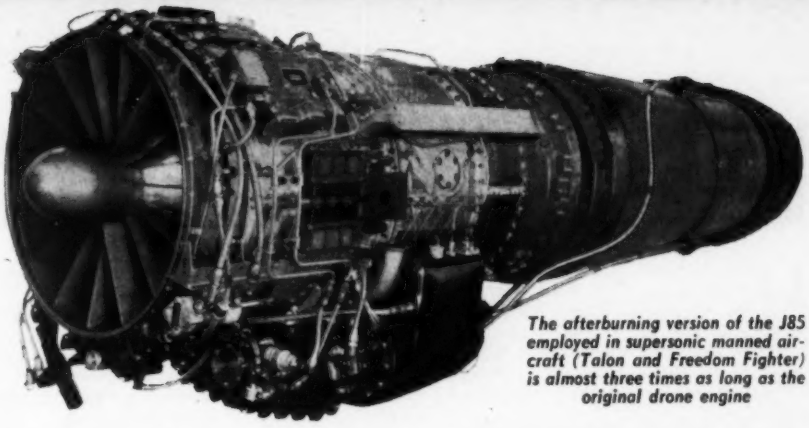
Most of the airports which the Comet will be visiting have already had some jet handling and air traffic control experience, both with the Comet on pre-proving flights, or with the Tu-104 or Caravelle, and the B.E.A. engineers at all overseas stations are receiving special training. Comet 4B holding procedures are in any case based upon Viscount practice and allowances are made for holding at the low jet altitude of 5,000ft.

When the Comet 4B was first announced, much prominence was given to the fact that its highest true air speeds were achieved at altitudes of about 24,000ft. But, in fact, on most of the longer routes the Corporation will operate the 4B along the new upper airways at heights at 30,000ft and above; the difference in block times between these heights and the optimum height for maxi-

(Concluded at foot of opposite page)

G.E.'s Small Turbojet

A NOTE ON THE J85: SIMPLICITY IN DESIGN



The afterburning version of the J85 employed in supersonic manned aircraft (Talon and Freedom Fighter) is almost three times as long as the original drone engine

DURING the past six years the Small Aircraft Engine Department of the U.S. General Electric Company at Lynn, Mass, have been actively developing a small turbojet in the 2,500 lb class. Designated J85, and sponsored by the U.S. Air Force, it is scaled to a mass-flow corresponding to the bottom of the weight/thrust curve and, as the data tables show, the achieved specific weight is commendable.

Initially the engine was planned for pilotless drones, although G.E. have kept an eye on manned applications and developed a version for piloted aeroplanes in parallel with the simpler unit. In configuration the J85 could scarcely be less complex. The main rotating assembly consists of an axial compressor built up from discs and hung between two bearings driven via a conical shaft by a single-stage turbine. A high-intensity combustion system is employed with an annular chamber having 18 burners. The first-generation J85s have a compressor with seven stages, the handling being improved by an inter-stage bleed system. These units, which are the only J85s currently flying, are regarded as interim models pending availability of the second-generation engines which incorporate a zero stage. For supersonic applications an afterburning variant has been designed, with a variable-area nozzle with multiple petals.

Like all the latest G.E. engines, the carcase of the J85 is fabricated by advanced methods. Indicative of this is the manner in which the two halves of the compressor casing are machined from Chromalloy (a stainless steel). Each blank has a "width" (around 180 deg periphery) of 28in, an axial length of 9.25in and a thickness of 1.25in (see sketch). The blank for each half-casing initially weighs 80 lb, and after machining to the profile shown in the sketch its weight is reduced to 9 lb. During the production of experimental YJ85s these casings were made by the Budd Company, five consecutive machining operations being required, with exceedingly careful heat-treatment to maintain the very close tolerances necessary.

The casing over the turbine section is likewise divided into upper and lower halves. Like many modern gas turbines the following features are intended to minimize the cost of maintenance: accessories are clustered above or beneath the forward end of the engine; stator vanes (clustered in segments) and inlet guide vanes can be replaced "without machining or destructive disassembly"; first- and second-stage compressor blades can be replaced without disassembly or removal of the rotor from the engine; the turbine disc can be replaced without complete dismantling or rebalancing of the engine; turbine rotor blading can be replaced in pre-coded pairs without rebalancing; and all fuel nozzles and igniters are individually replaceable.

Flight testing of the McDonnell GAM-72 Green Quail diversionary vehicle began in May 1958, since which time all flying of this missile has been accomplished with the J85-3. The J85-1 completed its 50 hr preliminary flight rating test in August 1958, and the -X version of this engine flew for the first time as the powerplant of the North American Sabreliner (prototype of the U.S.A.F. T-39 utility trainer) the following month. Over 150 hr have now been logged by prototype J85s in this aircraft, the 50-hr prototypes apparently having recorded double their authorized time. Also in September 1958 the first 15 hr qualification test was completed by the J85-3, clearing it for production Quails.

Flight testing of the J85 is being undertaken with various types of engine mounted in a retractable pod extended from the missile bay of a Convair F-102 intercepter. This aircraft first flew in March of this year, and in it standard and afterburning J85s have been flown at heights above 50,000ft and speeds greater than M 1.

J85 DATA

J85-5 afterburning engine. Intake diameter, 16.7in; nozzle diameter (max), 20.2in; overall height of engine, about 31in; overall length, 104in (32.5in engine plus 71.5in jetpipe); weight, 525 lb; thrust (standard day at sea level), 2,500 lb military rating, 3,850 lb with maximum reheat.

J85-7 non-afterburning engine. Intake diameter, 16.7in; overall height of engine, 31.5in; diameter across maximum flange, 17.7in; length of engine, 39.3in (42in including tailcone); weight, 325 lb; thrust (standard day at sea level), 2,450 lb military rating.

Static testing has involved over 150 hr of simulated altitude testing at the Wright Air Development Center, and tests at the Arnold Engineering Development Center have demonstrated the compatability of the engine with missile airframes under simulated flight conditions.

Most important current application of the J85 concerns the T-38 Talon and N-156 Freedom Fighter family under development by Norair. The first flight of a T-38 took place in April of this year, and the J85-1 non-afterburning engines currently fitted have exceeded pre-flight predictions and given excellent trouble-free performance. Both the Talon and the single-seat Freedom Fighter have many times exceeded the speed of sound by a substantial margin on the power of the early non-afterburning -1 engines.

On June 19 General Electric announced that J85s had run over 1,000 hr, of which 700 had been logged by the advanced J85-5. As the table of data indicates, the -5 is the first of the ultimate production engines with an eight-stage compressor. The -5 will be the standard powerplant of the Radioplane Q-4B supersonic drone as well as of the production Norair T-38 and N-156. The production non-afterburning engine will be the -7, which will become standard on the GAM-72. The -7 successfully completed its 15 hr qualification test last January and is now in production at Lynn.

In conclusion, mention should be made of the CF-700-1 aft-fan derivative. Using an almost standard J85 as gas-producer, this interesting engine will initially be rated at 4,000 lb; a description appeared in "Turbofans," published in our October 30 issue.

PROVING THE COMET 4B (continued from opposite page)

mum-speed cruise is generally only a matter of a few minutes.

Even so, B.E.A. are proud of the fact that at altitude their clipped wing Comets will cruise at M 0.76—50 m.p.h. faster than the Comet 4. The small difference in block times with altitude is a function of the Comet's high climb speed. The aircraft will climb at its M 0.76 cruising speed (330 kt I.A.S. below 23,500ft) so that the difference in the distance travelled is only the trigonometrical function of the sine of the climb angle. Normally the climb Mach number is achieved from 7,400 r.p.m. on the four Avons; a reduction to 6,800 r.p.m. is made when the cruising altitude is reached. After about half an hour at this height the r.p.m. can be further reduced as the weight decreases. B.E.A. are standardizing on a clean (dive brakes not used) descent to increase passenger comfort and to reduce the cabin angle. From 30,000ft descent is started about 15 minutes out from the destination airport with the Avons rotating at their flight idle speed of about 5,000 r.p.m. (depending upon the altitude). To increase the rate of descent, r.p.m. on the inboard engines can be reduced to ground idle, but the outboards must be kept running sufficiently fast to maintain cabin pressure. Fuel reserves are calculated in just the same manner as they are with the Viscount; when the diversion airfield is selected, enough fuel is allowed to descend to break-off height at destination, to climb back to the best height to reach the alternate, and to hold there for 45 minutes at 5,000ft.

At the end of this first series of proving flights two captains and two first officers will probably complete their Comet training, which has included base training at Stansted and some hard work on the simulator. Over 100 hours' flying were completed between November 9 (when the first two aircraft were delivered) and the beginning of December and the Comets have operated some 6 hr a day with exceptional reliability. Apart from an unimportant nick on the first stage rotor blades, as a result of a stone picked up during the first-ever jet landings at Tel Aviv, the Avons have caused no concern at all.

A. T. P.

Straight and Level

DID you read that Mr. Kruschev flew in an Mi-4 helicopter the other day? When somebody asked him how he thought it compared with President Eisenhower's new Sikorsky S-58, in which he has also travelled, he replied that he thought it was rather quieter.

Frankly I thought he was shooting a bit of a line (remembering that the design of the Mi-4 must be something like ten years old). But what do I find now?—a Sikorsky engineer reporting first-hand and absolutely independently on the Russian helicopter: "I flew in the cabin, which was quiet (about 90 decibels). Conversation was easy and the vibration level especially low."

Good for Mr. K.—and Mr. Mil.

● I ought to have added, Good for Mrs. Mil, too, because I find that for the past 15 years she has been her husband's chief of stress analysis. Which means that she has been very largely responsible for the world-beating 71,000 lb, 80-passenger Mi-6.

Remember Blossom Miles?—how years ago she did a similar job for her husband, "F. G."?

● Most symposia are undisguised pretexts for some good old-fashioned swanning. But there surely never was such a majestic concept of the ancient art as that which marked the IAS-Navy Antisubmarine Warfare Symposium at San Diego, Cal, earlier this year.

The first two days were given over to some apparently rather superfluous secret technical sessions, whereat more than a thousand registrants [sic] were briefed on aspects of antisubmarine warfare research and analysis. There ensued a spasm of lunching and dining, and then the Navy proceeded to hit the jackpot by producing a little symposium of its own, comprising the antisubmarine aircraft carrier U.S.S. *Yorktown*; the destroyers U.S.S. *O'Brien, Walke, H. E. Hubbard, H. T. Small, Prichett, Cowell, D. J. Buckley, Cushing* and *Evans*; and the submarines U.S.S. *Segundo* and *Diodon*. The registrants having been safely embarked, the armada headed out into the broad Pacific for a first-hand look at antisubmarine warfare. To this end the party was joined by Grumman Trackers of Air Antisubmarine Squadron 23, helicopters of Antisubmarine Squadron 4, and long-range P5Ms of Patrol Squadron 46.

It certainly seems to have developed into the most monumental swan. I for one hope that it was enjoyed by all hands; and if, as is my guess, it achieved the biggest back-to-the-drawing-board movement of recent times, this was certainly one worthwhile symposium.

● The chairman and managing director of Scruggs Aircraft, Sir John Blackout-Jones, called a secret meeting of his senior management last week to see what could be done about the firm's continued failure to meet its target dates.

At the end of a lengthy discussion, Blackie (as this great man of British aviation is affectionately known) drew up the following memorandum:—

"(1) Contracts with customers should not include any specific undertakings about delivery dates. This will incidentally make vexatious penalty clauses unnecessary.

(2) All schedules will be decided by myself, or in my absence by Mr. Laggard, commercial contracts manager.

(3) No one in the firm, least of all the people on the shop floor, should be given any idea whatsoever of production and delivery schedules. They have no need to know, and anyway they care only about clocking off at 5.30.

Note for Mr. Washbrain, p.r. manager:—

If the Press ask when the first S.A.461 is due to be delivered to Plummet Air Lines, tell them that this is a private matter between Scruggs and Plummet. If absolutely forced to give information, conform to our standard statement (my memo. ref. 4691/1952): 'Delivery may be made in the latter half of 1961.' A good smokescreen here is to say 'winter of 1961,' which sounds better because it *could* mean early in 1961. On no account give a precise date like, for instance, 'September 15, 1961.' This is vulgar and the sort of thing the Americans do.

General Policy:—

By eliminating target dates entirely we shall never again fall behind our schedules. I know I can rely on you chaps to give me your usual full support in this regard."

● That excellent magazine *Intercom*, the journal of B.E.A.'s flying staff, has an item in its current edition which particularly appeals to me—a courteous letter sent by B.E.A.'s commercial people to a passenger. I summarize it here because it seems to me to be a model of what all airline answers-to-complaints should be.

"Thank you very much for your letter of February 6. I take your point and sympathize with it. [The answer to the point was then clearly stated.]

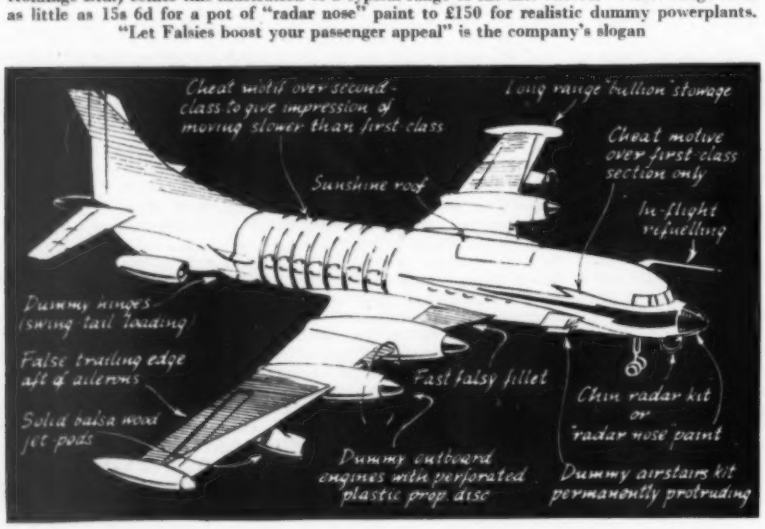
"Having said this I would like also to say again that I regard your criticism as both fair and constructive and we are doing everything we can, in face of the changing demands of larger aircraft loads and mass travel, to retain the personal and friendly touch. In this, I believe we stand high amongst the world's airlines, and indeed you were good enough to refer kindly to the service given to you by our staff in Paris. We are not at all complacent about our standards, however, and will keep on our toes.

"I hope that we shall be able to retain your good opinion of us on many future journeys."

● Mr. S. S. Awberry (Lab., Bristol Central) said in the Commons last week that it took longer to get from the West London air terminal in Cromwell Road than it did to fly from the airport to Paris. Mr. Duncan Sandys, Minister of Aviation, replied amid laughter: "The trouble is that aeroplanes fly so fast these days."

ROGER BACON

From a sales brochure just published by Flight Falsies Ltd. (a new subsidiary of Boost Holdings Ltd.) comes this illustration of a typical range of the kits offered. Prices range from as little as 15s 6d for a pot of "radar nose" paint to £150 for realistic dummy powerplants. "Let Falsies boost your passenger appeal" is the company's slogan


Cheat width over second-class to give impression of moving slower than first class
Long range "billion" stowage
Cheat motive over first-class section only
Sunshine roof
In-flight refuelling
Dummy hinges (swing tail loading)
False trailing edge aft of ailerons
Fast falsy fillet
Chin radar kit or "radar nose" paint
Solid balsa wood jet pods
Dummy outboard engines with perforated plastic prop. disc
Dummy airstairs kit permanently protruding

China's Civil Aviation

AIRLINES, AIRPORTS, AGRICULTURAL AVIATION; SURVEY

TEN years ago, when the Kuomintang fled, they left in their wake a train of ripped-up runways, destroyed installations and wrecked aircraft that they could not fly out in time. They threw every possible spanner into the works to thwart the resumption of air services, although there was then little Chinese national civil aviation worthy of the name. Foreign airlines, Pan American in particular, were in control of the country's civil air services before 1949.

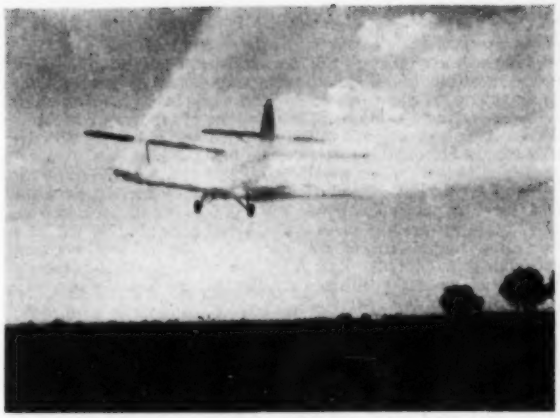
Today every aircraft and all the ground installations are manned by Chinese. A network of some 36,600 km (22,700 miles) spans the whole country. Aircraft made in China's own factories hop about the countryside or over areas hard of access by other means. China's civil aviation has changed as dramatically as the situation in all other spheres of the country's life.

From the very first days of the inception of the new civil aviation the Central People's Government took its development in hand, creating the Civil Aviation Administration of China (CAAC) as the governmental regulating organ and operator for every branch of civil aviation in the country. The China National Aviation Corporation and Central Air Transport Corporation, which had evacuated to Hong Kong when Chiang Kai-shek was driven from the mainland, renounced Taiwan Kuomintang control in November 1949 and were repatriated to become a part of CAAC. Then, from August 1950 onward, domestic services were inaugurated one after another. An international service, between China and the Soviet Union, was also started in 1950 by the Sino-Soviet Aviation Corporation, a concern run jointly by China and the Soviet Union, and taken over by CAAC at the end of 1954, when its shares were made over to China by the Soviet Union. Today, compared with 1950, air transport is 3.2 times as great in terms of length of air routes and 19 times as great in terms of volume of traffic. The yearly rise in cargo ton-kilometres averaged 27.7 per cent for the first five-year plan period and reached 61.3 per cent in 1958, that year beginning the big leap forward. It is hoped that total ton-kilometres for 1959 will show a 30 per cent increase over 1958.

Peking is the hub of operations and there are regional centres at Shanghai, Canton, Lanchow and Chengtu. Air routes, including four to foreign countries, now link 72 cities—three times the number in 1953. On many routes the frequency of flights has increased from a mere trickle to daily services and larger and better equipped aircraft have been introduced on all the trunk routes. On July 1, 1958, passenger fares and freight rates on all the domestic lines were reduced by 40 per cent. These facts, among others, indicate the tempo of growth of China's air transport in the past few years.

But an appraisal such as this must also examine other aspects, especially the different principles under which the particular air transport system operates. The underlying idea in China is the mutual interest of the airline and the passenger. So fares are kept low, and today many workers and peasants travel by air—something inconceivable in the old days. There are, for example, occasions when members of the CAAC staff help out a passenger who has unexpectedly run out of cash.

The underlying principle is different, too, in the freight services. Having no interests other than the public welfare, CAAC often carry goods which might not seem economic to Western airlines. For instance, water-weeds are carried by the ton for proliferation on far-away farms for use as pig fodder. The seeds of rubber plants were rushed by air to new plantations for timely germination. On one occasion 2,200 sheep were transported thousands of kilometres by air to raise new breeds in distant provinces. In the spring of 1958, when expansion of foodstuff production was the order of the day, aircraft shuttled 1,446 tons of potato shoots from nurseries in Peking and other areas to farms in southern Hopei Province. Later in the year, when the country went all out to increase steel output, 2,260 tons of equipment went by air to steel mills and local furnaces. This year billions of fish fry are being distributed by air in special containers.



"Aircraft have become an effective implement in fighting crop pests"

The comparative importance of local routes is another distinctive feature of CAAC. Tapping not only metropolitan centres, air routes connect many outposts and provincial places. Many new industrial settlements in desert and out-of-the-way areas, such as the Karamai oilfield in the Kuldja Kazakh Autonomous Region, and the Paotow Iron and Steel Works on the fringes of the Gobi Desert, are now served by air, along with a number of national minority centres like Kashgar, the Kirghiz centre in western Sinkiang, Hotien, the Uighur centre in southern Sinkiang, and Sharasume, the Kazakh centre in the Altai mountains. Heiho, a tiny settlement on the Amur River, which used to be snow-bound and shut off from the outside world for three-quarters of the year, is now only a few hours away by CAAC service from Harbin, the provincial capital. Lhasa, "on the roof of the world," which had been once regarded as a forbidden zone of the air, is now served by non-scheduled flights.

Much importance is attached to safety. CAAC stands firm on the principle that no accident is humanly unavoidable. Flight safety is assured by a regiment of technical and disciplinary measures. Campaigns for trouble-free flying are carried out from time to time and the necessity and feasibility of 100 per cent flight safety is dinned in to everyone concerned.

The growth of China's socialist economy calls for extensive application of the latest techniques in industry and agriculture, including the use of aircraft. CAAC is now effectively performing 15 different major duties in aerial work, not counting many secondary subdivisions. Entirely unknown in old China, these duties (which began in 1952 with forestry work) are now taking up a whole branch of the CAAC and the volume of work in 1959 has been some 25 times that of 1952.

One of the regular duties is aerial surveying. Equipped with various types of electronic instruments, CAAC aircraft now form a permanent arm of the geological surveying department, plying over inaccessible areas or places that would take too long to survey by land. Magnetic surveying for ferrous minerals has been carried out in many parts of the country, and numerous valuable resources have been located. Aerial prospecting for oil has also been carried out over parts of the coastline.

As many parts of China have not yet been properly mapped, aerial photography is also an important sphere of action. The

"Peking is the hub of operations" (the central buildings at the Capital Airport are seen on the left and the lounge on the right)

China's Civil Aviation . . .

more outstanding work done in the past years includes the photographing of the deserts of the Tarim Basin, of the virgin forests in the north-east and south-west and of the marshlands of Heilungkiang in the north-east. The work in such areas often faces very trying conditions in the absence of topographical landmarks. Aerial photography has provided valuable data for the designing of big construction projects and the selection of routes for new railways. In one month 9,000 sq km were covered by air photography for the construction of the dam systems at the Sanmen Gorge on the Yellow River; the task was one that would have taken years by ground surveying. Aerial photography led to a shortening by 36 km of the route for the railway between Kweiyang and Yunfeng. Last April, for town-planning purposes, Peking was photographed from the air; it is the first city in China to be mapped in this manner.

The nation's efforts to develop agriculture, the growth of co-operative farming, and the recent formation of the people's communes, have stimulated extensive use of aviation for agricultural purposes. Aircraft have become an effective implement in fighting crop pests, and many traditional breeding grounds of locusts have been wiped out after repeated aerial treatments since 1953. Large-scale dusting against locust outbreaks has been carried out this year over some 630,000 hectares in Hopei, Honan, Shantung, Anhwei and Kiangsu provinces. Successful operations have also been conducted against cotton pests, rice borers, wheat midges and wheat rust. In 1956 aerial treatment applied against bollworms on 3,200 hectares of land in a county in Shantung Province gave an 18.4 per cent increase in cotton yield. Last year the yield was further raised by 40 per cent over an area of 20,000 hectares in another county in the same province. Aerial duties undertaken lately include orchard spraying, forest dusting, the application of top-dressing fertilizer for wheat, and the sowing of vegetation to arrest the spread of sand in the desert areas.

Throughout the period of Kuomintang rule there was hardly an airport built for civil use, the airlines then depending chiefly on such facilities as were given up by the military. The development of civil aviation in New China has been backed up by a solid programme of capital investment for construction and improvement of ground facilities. Since 1952 an airport development plan has been in operation, as a result of which capital layout in the period 1953 to 1957 was six times that of 1950 to 1952, the rehabilitation years. In the period 1958-59 it is nine times as much. From 1953 to 1957 seven airports were rebuilt or newly built. This year alone five new airports are under construction, three of which will be capable of accommodating international airliners. The Capital Airport in the eastern outskirts of Peking, which opened to the public last year, is the first civil airport ever built in China to a properly worked-out overall plan. Work will continue on it for several years to come. When completed, together with its maintenance and overhaul workshops, it will rank among the world's best airports. With the control tower and operations offices in a separate building, this large, up-to-date terminal has every amenity for passengers, even including a nursery and a cinema.

Civil aviation's rapid pace of growth demands an increasing number of trained personnel. With unremitting assistance from the Soviet Union, which has been essential throughout the growth of civil aviation in New China, CAAC has quickly passed through a short period of transition to operations by all-Chinese crews. In addition it has successfully carried out a number of training programmes. Regular civil aviation schools have been established, and from them a steady stream of competent men and women have graduated and taken up positions in every branch of China's civil airlines.

HO LO-WEN

"A Substantial World"

BACON had a word to say on them, as on most matters. Books, the great essayist concluded, "will speak plain when counsellors blanch" (perhaps remembering cynically how some advisers deceived him when he held high office). Diaries also received his commendation. "Let diaries, therefore, be brought into use," he said unequivocally when writing about travel. Bacon was not, perhaps, referring to pocket-diaries in the modern sense; but wise advocacy such as his, both for books and for diaries, is not to be sniffed at. Even if it were, we have Wordsworth's later assurance that books "are a substantial world, both pure and good." The question that always arises as present-giving time draws near is what sort of books and diaries to give, and the following suggestions may help. Whatever the interests of recipients, there is bound to be something suitable in the rich variety of titles published by Iliffe & Sons Ltd. Aviation is of interest to everybody in these days and the *Boys' Book of Flight* (12s 6d net; by post 13s 6d) has 48 pages of fine photographs, and its text includes a chapter on space satellites and rockets which was re-written for this new impression. For the young technician, *Gas Turbines and Jet Propulsion* (35s net; 36s 9d) offers an authoritative guide to the principles and history of its subject; and for the old connoisseur, wishing to re-savour the pioneer days, *Fellowship of the Air* (30s; 31s 9d) tells the story of the Royal Aero Club from its balloon beginnings to 1951.

Road-users (and who among us are not, in one form or another?) are exceptionally well served by Iliffe books. For adventurous motorists there is *Go Continental—By Car* (17s 6d; 18s 5d), calculated to fill the Christmas fireside with sunny visions of Monaco and the Costa Brava; and for those who fancy their skill behind the wheel, *Car Driving as an Art* (12s 6d; 13s 6d). Round about now, many people are thinking of next year's holiday plans, so *Caravanning and Camping for Motorists* (8s 6d; 9s 2d) may come in useful; and *Value-for-Money Motoring* (7s 6d; 8s 2d) discourses on what is a perennially valuable objective. During the past six months our associated journal *The Autocar* has been carrying out road tests on various new makes of car (including, for example, the Triumph Herald and Rover 3-Litre) and these reports are now published as *"The Autocar" Road Tests, Autumn 1959* (6s 6d; 7s 2d). For those who ride motor cycles, there is *Hints and Tips for Motor Cyclists* (7s 6d; 8s 2d); and for scooter fans, *Scooters and Mopeds* (7s 6d; 8s 2d).

Road-users are also well catered for when it comes to Iliffe diaries (published by T. J. & J. Smith Ltd., 12 Hanover Square, London, W.1, in conjunction with the journals concerned); and so are yachtsmen and radio enthusiasts. Prices for *"The Autocar" Motorists' Diary 1960*, *"The Motor Cycle" Diary 1960* and *"Wireless World" Diary 1960* are all the same: 6s 3d leather (incl. 11d p.t.) and 4s 6d Rexine (incl. 8d p.t.); postage 4d. The *"Yachting World" Diary* is rather more expensive, because of its covers and larger format: 9s 9d in real Morocco leather (overseas 8s 6d) and 6s 3d in waterproof leather cloth (overseas 5s 6d); postage 5d. Each of these diaries contains comprehensive and valuable information relevant to its subject.

TV enthusiasts and photographers are also well served by Iliffe books this Christmas. To help viewers out of a difficulty when the family set behaves embarrassingly, there is *Correcting Television Picture Faults* (3s 6d; 4s); and to make the set better than the Browns' next door, *Improve Your Television Reception* (5s; 5s 6d). Those who have photographers among their friends could not do better than secure for them the *Dictionary of Photography* (21s; 22s 5d), providing "an answer to every photographic problem," or *The Complete Amateur Photographer* (25s; 26s 3d). Finally, *Photograms of the Year, 1960* (18s 6d; 20s 3d) should give pleasure not only to photographers but to all those who find pleasure in the art of the camera at its best.

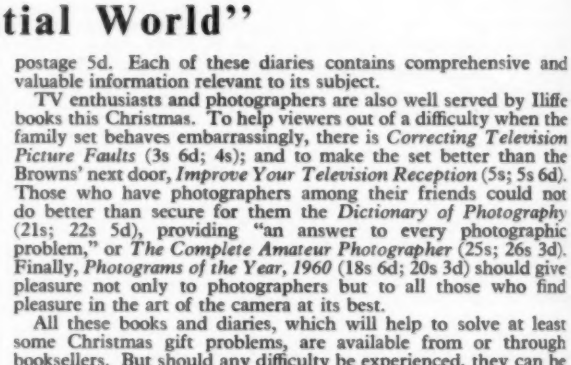
All these books and diaries, which will help to solve at least some Christmas gift problems, are available from or through booksellers. But should any difficulty be experienced, they can be obtained from Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1, at the postal rates specified.

REALISM IN PLASTICS

SOMETHING new for the collector of models of World War I aircraft is a range of 1/48th-scale plastic kits by Aurora, introduced by Playcraft Toys Ltd. at 3s. The mouldings match up accurately, and excellent transfers are supplied.

The two kits sampled by us, the Nieuport II and Fokker DR-1 Triplane, went together very easily and presented no problems with rigging angles.

For those who want quick results, about one hour's work, exclusive of painting, is all that is required for assembly. The rotary engines are not designed to rotate, but can be made to do so by simple modification. The inclusion of a good general arrangement drawing would be helpful.



The Fokker and Nieuport models referred to above

The Taylor ultra-light G-APRT about to touch down at White Waltham with Titch Holmes at the controls. As reported in "Flight" of June 19 last, this aircraft was built at home by Mr. John Taylor and is powered by a 36 h.p. J.A.P. engine. Some 40 hours' flying has now been logged

Sport and Business

AN INDICATION OF GOVERNMENT INTEREST, if not support, in the production of a new British light aircraft, was given by Mr. Geoffrey Rippon, Parliamentary Secretary to the Ministry of Aviation, at the annual dinner of the Association of British Aero Clubs and Centres on Wednesday, December 2. Mr. Rippon made the point (which has been obvious to many people outside the Government for many years) that, unless a new serviceable small aircraft were produced, this country's position would be seriously prejudiced in the light-aircraft field. There should be a Commonwealth interest in such an aircraft, he continued. This further statement of the obvious was followed by the pledge, "I shall do my best to interest manufacturers in this before it is too late." As for the type of aircraft needed, the Government was grateful for the advice received from the A.B.A.C. (the Association, in addition to the Royal Aero Club and the Popular Flying Association, were invited earlier this year to put forward specifications for such an aircraft).

The president of the Association, Viscount Runciman of Doxford, reported that the membership now comprised 72 clubs and centres (including six overseas), 24 groups and 22 firms' clubs. Last year's total flying time was more than 88,000 hr. Recent developments included the scheme for hire-purchase flying (*Flight*, December 4) arranged with United Dominions Trust Ltd., under which sums up to £200 could be advanced for flying training, with repayment at six per cent interest per annum spread over periods up to 18 months. Among the president's further remarks was the suggestion that, had the Government disposed of ex-R.A.F. aircraft to the clubs through the A.B.A.C., the Treasury would have received more money. Concerning flying training to C.P.L. standard, the cost of the 68 commercial licences obtained at member-clubs of the Association during 1958 worked out at about £1,000 per head, compared with the estimate of almost £5,000 per head (admittedly including a "wide and liberal university-type education") quoted for the new Government-backed College of Air Training. The Association had compiled courses for the C.P.L. and Instrument Rating and had tried to set up an air training trust, but the trust "hasn't perhaps gone too well." The basic question was whether or not the Government believed private flying to be a good thing: whatever the answer we should frankly be told.

In a speech proposing the health of the guests, Viscount Bledisloe, a vice-president of the Association, disclosed that "the nucleus of a radio sub-committee" of the standing joint committee on private and club flying and gliding was drawing up a specification for radio equipment for light aircraft. Under the Air Training Corps flying scholarship scheme 370 cadets had gained P.P.L.s in the first ten months of this year, bringing the total since July 1950 to 2,680. The final speaker at the dinner was Lord Ogmore, who was the Minister of Civil Aviation largely responsible for the introduction of the firms' flying club scheme.

The Lennox-Boyd Trophy for the most efficient club was presented to W/C. R. J. B. Pearse of Exeter Aero Club. Fair Oaks was stated to be a close second, followed by Surrey, Elstree, Southend, Ulster and Newcastle. The donor of the trophy, Alan Lennox-Boyd M.P., has recently been elected a vice-president of the Association.

FIFTY THOUSAND AIRCRAFT have been produced by Piper Aircraft Corporation of Lock Haven, Pennsylvania. The 50,000th machine, an Apache, was handed over on November 10 to the president of Firwood Manufacturing Co. of Dearborn, Michigan, who will use the aircraft for transporting executives and clients.

PRODUCTION AND SALE of small aircraft for business and utility purposes in the U.S.A., which more than doubled between 1954 and 1958, continues to increase. In the first nine months of 1959, according to Orval R. Cook, president of the Aerospace Industries Association, approximately 5,600 aircraft were delivered at a total retail value of $128m. For the corresponding period last year the figures were 4,725 aircraft valued at $102m; while the 1958 total for the year was 6,414 aircraft valued at $135m.

Handing-over of the 50,000th Piper aircraft, an Apache, at Lock Haven (see news item above). From the left, W. Kilgore, sales manager, Firwood Manufacturing Co.; J. W. Miller, Piper general sales manager; M. Ericson, Firwood president; and Piper dealer A. Finney

FIVE PARACHUTE CLUBS are currently operating in this country, according to the December issue of the *Royal Aero Club Gazette*. They are the British Parachute Club, Fair Oaks, with 80 members and "a similar number" on the waiting list; British Skydivers Parachute Club, Thruxton, with five members; Oxford Parachute Club, Kidlington, with twelve members; Ripcord Club (previously Stapleford Swallows Parachute Club), Stapleford Tawney, with 15 members; and a club formed by the 21st (Artists' Rifles) Special Air Service Regiment (T.A.) at Thruxton. The chairman of the Royal Aero Club's parachuting committee, Mike Reilly, has recently succeeded Maj. T. W. Willans as R.Ae.C. representative on the parachuting committee of the Fédération Aéronautique Internationale.

THE BREGUET 906 CHOUCAS, a two-seat version of the 905 Fauvette, made its first flight at Toulouse recently, piloted by Bernard Witt.

A NEW APPROACH to glider operation is to be introduced in this country in the New Year. Sponsored by a recently formed company known as Soaring Holidays (Glider Hire) Ltd., the scheme will provide complete gliding and caravan camping outfits which can be hired by parties of four for gliding holidays at recognized club sites. A special version of the Olympia 2b built by Elliotts of Newbury will be employed, together with a special two-purpose trailer which not only is used for glider retrieving but contains all the facilities of a four-berth holiday caravan. While the trailer is being used as living accommodation on the site, the glider will be picketed out nearby.

The intention is to provide these facilities at a total cost, including retrieving, food, accommodation and flying, of 15 guineas per week per person. This cost is considered to be comparable to that of hiring equipment for yachting holidays along the same lines. The minimum requirements for pilots are possession of a C certificate, 15 hr gliding time, and experience on the Olympia or equivalent machine (or a check on the type). One member in each party must be qualified to carry out daily inspections on the Olympia, and he will be in charge of the group. Flying will normally be carried out at a recognized gliding club site, where the party will come under the local flying regulations as laid down by the C.F.I. By special arrangement, hired machines

RETROSPECT

From "Flight" of December 11, 1909

Flight Meeting for Halifax: Arrangements are being made by the management of the Halifax Zoo and Amusement Park to hold a flying meeting on their grounds, commencing on Christmas Day and continuing till January 8th. It is said that three entries have so far been received—a monoplane which appeared at Blackpool, Mr. Pickersgill's machine from Keighley, and a biplane from London. With a view to stirring the aviators to make the most strenuous efforts to fly, they are to be paid £1 for every minute they remain in the air.

Two new developments in British gliding, reported below and on the previous page, are the formation of a company to provide complete gliding and caravan camping outfits for hire by parties of four people; and the establishment of the West Wales Gliding Association. Above, left, at the Association's inaugural course earlier this year, Ann Rogers, Norah Seagar, Peter Ryalls, Bill Bowen Rees, Mrs. Edna Horley, Gilroy Phillips and John Horley, with T.21b "Daisy Mae" ("Western Telegraph" photograph). Above right, the first Olympia 2b to be delivered to Soaring Holidays (Glider Hire) Ltd. by Elliotts of Newbury. T. I. Quinn Hall, managing director of the hire company, is in the cockpit

SPORT AND BUSINESS . . .

may be used at a non-recognized site, abroad, or in contest flying.

The company has already taken delivery of its first Olympia. This will be used in proving the scheme and touring gliding clubs between January and March 1960, when a decision will be made concerning expansion of the fleet. A maximum of ten aircraft could be available by the end of next year. The company, whose directors are T. I. Quinn Hall, Charles Lagus, Geoffrey Mulligan and Mrs. D. Wood, has consulted and received the approval of the British Gliding Association in formulating the scheme.

WEST WALES GLIDING ASSOCIATION is the name of a new organization formed to provide gliding and soaring facilities for members in Pembrokeshire, Cardiganshire and Carmarthenshire. The Association's main site will be Withybush Airfield, Haverfordwest, and the intention is to form a number of constituent gliding groups within the area.

The idea that such an association should be formed was put forward about a year ago, and a preliminary weekend course to ascertain local interest and evaluate the site was held last Easter. On that occasion the Perkins Gliding Club's T.21b *Daisy Mae* and a Cambridge University club trailer were borrowed, and Graham Spillman of Cambridge organized the auto-towing and ground handling, with T. Gilroy Phillips as chief flying instructor. Acting secretary Arthur Squibbs enrolled 17 members for the course. Starting at 8 a.m. on Good Friday, a total of almost 200 circuits were logged during the four days of the Easter holiday.

Negotiations are currently under way with the Ministry of Aviation and Pembrokeshire County Council concerning a licence to use Withybush, and it is hoped to purchase a T.21b from Slingsby Sailplanes. A trust company is being formed to control the finances of the Association, and members are now being enrolled. Enquiries should go to Arthur Squibbs, 36 High Street, Tenby, or T. Gilroy Phillips, Clarence House, 1 The Esplanade, Tenby.

AIR TRAFFIC IN THE TINDERBOX AGE

FOR a visitor to Britain to read—as he might have done last month—of an aircraft being navigated through the London Control Zone by the spark of a lighter flint, could provide him with justification for asking if British private flying is still in the tinderbox age. He must have been equally surprised to hear that the same radio-equipped aircraft completely held up traffic at London Airport for 23 minutes, and he would have been positively astonished that some of the most efficient radar in the world was apparently unable to spot the intruder.

And although perhaps we are not particularly concerned with the reactions of visitors to this country's private flying troubles, this particular incident has served to turn the minds of many to some unquestionable deficiencies in the way we organize our sporting and business flying.

What is most disturbing is not that a pilot should get lost or even that he should get caught out after dark. These are human errors of which we must always take account. What is remarkable is that this particular situation should ever have been allowed to deteriorate so badly; that a pilot should ever be able to get so far off course and that the consequence of error should be so enormous.

Now everybody knows that with navigation properly applied and with radio properly used there should be few departures from orderly and regular flights, but it is suggested here that more practice than many private pilots are able to put in in any one year may be needed if they are going to fly according to the book. There are plenty of airfields all over the country that are glad to give homing and fixing facilities. Assistance can always be obtained from Flight Information Centres, and if the worst comes to the worst there are procedures laid down for rendering quite massive assistance in various degrees of distress.

Yet so wide has the gulf become between the professional and the amateur pilot that human nature itself can be the latter's enemy. In a professional pilot's world the fear of embarrassment to the 20-hour-a-year man can be acute, and the fear of a system designed to aid *every* pilot can make its benevolent function almost useless. The smooth, competent conversation of the airline captain using his radio as a work-a-day telephone can impose a fear of unspoken scorn upon the pilot calling a local tower with the few phrases that he knows he can confidently use. The apparent complexity of swapping frequencies, calling strange voices in strange towers and the apparent risk of revealing a predicament where none may exist, is limiting the use of what is now essential equipment to a cross-country pilot.

Surrounded by airways and control zones, and regulations which he had honestly meant to study more fully, our hypothetical private pilot is not discharging the few real obligations to the airborne community which are imposed upon him.

And the gulf between the professional and the amateur is widened by a widespread distrust of the private pilot by the professional men on the ground and in the air. Many private pilots almost believe that for the airlines "to file a near-miss report is part of the cockpit check" and that the Corporations and the Ministry of Aviation are ganging up to displace his often elderly, usually wooden and invariably under-equipped aircraft from the air. Yet the time is not far hence when better equipment and proper light-aircraft navigational aids will be available for all who can afford them and want to use them, and it is important for both private flying and the regulatory authorities to take a fresh and realistic look at the private and business pilot's needs. A question of safety is involved and, as in nearly all such cases, an understanding of the human problems is the first step towards a more realistic legislation than we have at present. This is an urgent task for the newly established Air Traffic Control Board, who might give early consideration to establishing the common "club frequency" in the United Kingdom.

The plain fact remains that the airman's bible, *Air Pilot*, is so bulky and intimidating a document that too few private pilots are now taking the trouble to examine it properly; to learn the relatively simple rules that apply to them; and to be confident that they are not infringing them once they are in the air. What is urgently needed, it is suggested, is a new preface to *Air Pilot* dealing only with those matters that concern the private pilot flying clear of the airways system—whether "contact" as he does at present, or with V.O.R. and A.D.F. radio aids as he will do in the future. A ready and up-to-date reference is also needed to all the airfields where a private pilot can land without prior permission; to aeronautical stations that can be contacted on the limited frequencies of the radios that are now generally in use; and to the steps to take to obtain information about the weather, about position fixing and about finding the way home.

Above all, the language of the new section of *Air Pilot* should be concise, without jargon, and in simple as-spoken English. This step in benevolent legislation could restore confidence and respect where something dangerously like enmity now too often exists.

A. T. P.

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. The names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Russia and Rotorcraft

FURTHER to your editorial of November 13, "The Red Flag . . . and the Red Light," there was a report in *Aviation Week* of June 22, 1959, to the effect that the Russians, after having investigated other forms of VTOL such as jet-lift, tilt-wing, etc., have decided to concentrate their efforts in this field on increasing the forward-flight performance of the helicopter.

This is surely an instance of the Soviet "flexibility of manœuvre" which, according to the Canadian-American Committee, may enable them "to dominate the next stage in the development of air transport in under-developed countries."

The "may" in this conclusion will become a "will" if both the Americans and ourselves do not transfer the multitudinous research and development effort into detailed analysis of long-term VTOL projects to advancing the performance of the current practical VTOL machine, i.e., the rotorcraft.

Derby. FLAPPING BLADE.

Publicity Overseas

I READ with interest F/O. Thomas's letter headed "Export Opportunities" in your issue dated November 20. Whilst not being an expert on these South American countries, from what I have read I am in complete agreement with him. The fact that these countries prefer to buy British is borne out by their purchases of military aircraft.

The reason for our lack of sales in Latin-America is, I think, either lack of salesmen or lack of incentive in those that are there. There would seem to be a tendency in the industry to sit back and wait for the orders to pour in. In the transport-aircraft field Britain has caught up and surpassed America in technicalities, but without salesmanship to match, they will never be more than poor relations. Recently on B.B.C. Television there was a programme that showed the Vickers Vanguard, and near the end of the programme somebody (either Sir George Edwards or Raymond Baxter) expressed the opinion (or hope!) that this aircraft would "sell itself." Surely this is the wrong way to set about it?

London, S.E.18. A. MIDDLETON.

Agricultural Aviation

THE attendance of over 250 delegates from 25 countries at the international conference on agricultural aviation, at Cranfield, last September, proved how widespread was the interest in this comparatively new aspect of farming practice. The industry, as it was called by many of the speakers and delegates, is a very real one: ready to operate in any part of the world with helicopters and fixed-wing aircraft, using chemicals (specially formulated for aerial application) against pests and diseases and to stimulate crops in need of top-dressing.

In this country, the 1958 potato blight period taught growers, as never before, the real value of aerial application of agricultural chemicals. The rapid and widespread action, available at comparatively short notice, proved that an aerial campaign, such as this one, could be a very valuable means of protecting the country's food supplies from serious reduction by disease or pest.

However, what was a satisfactory result in 1958 for farmers (and, of course, commercially satisfactory to the efficient aircraft owner) turned into disillusionment and depression for the operator in the following year, when little or no work resulted from a season's weather highly favourable to the grower and, therefore, conversely, not to the agricultural aircraft owner. The worst-hit amongst the fairly large number comprising the industry at that time were those who had come into this kind of work in the previous boom year and were now realizing that one good year's revenue did not compensate for the next year's lack of sustained operation and consequent lack of funds to meet comparatively heavy current expenses.

The lesson to be learned from what we have seen in the last few years makes it imperative that the industry, such as it is, be stabilized in numbers and operational technique so that it becomes a dependable task-force, available to meet any farming emergency such as potato blight or other disease or pest. At present, because of general lack of stability, operators come and go, with no one, apparently, to advise them on the overall prospects, or warn them about the lack of them, in this kind of aerial adventure.

Many of the newcomers know nothing of farming, except, perhaps, what they may read under scare-headlines in the sensational type of newspaper, and they know even less of the relationship of weather conditions to crop-growing conditions, or the varying incidence of pests and diseases produced by certain types of weather conditions. These newcomers are, usually, basically aircraft operators who are seeking another outlet for their perhaps-underworked aircraft. The fact that an aircraft is only an overhead platform, in the air for the sole purpose (at that particular time) of accommodating spraying or dusting equipment, may not have occurred to them. They also probably do not realize that the aviation side of the project may represent less than half of the total know-how required to complete the job successfully.

For these reasons, and many others, there should be a source of overall information available to them for their general operational guidance and economic safety.

At the Hague there is an *international* organization, under the able administration of Dr. W. J. Maan, which deals with purely international agricultural aviation. In the United Kingdom there are two representative bodies dealing with the subject: these are the aerial spraying committee of the National Association of Agricultural Contractors, and the Agricultural Aviation Group of the Royal Aeronautical Society. The former is operational in outlook and the other is mainly interested in the technical aspect of agricultural aircraft design and operational problems affected by design limitations. In spite of the indefatigable efforts of the two very valuable groups, there does appear to be a very real need for an individual *agricultural aviation counsellor* (probably acting under the joint sponsorship of the N.A.A.C. and the R.Ae.S.) to advise present operators and, perhaps more particularly, those considering entering the already overcrowded band of operators, on the varied aspects of the industry as a whole. He would also have in mind, at the same time, the need to stabilize the total number of operators available and so prevent too many from chasing too little work (which most certainly has been the case, to the detriment of all concerned).

The counsellor could deal, too, with the demand-and-supply aspect of operations in time of emergency and so see that the operators available at any one time get a fair share of the work. He could also give outspoken, unbiased advice (having nothing tangible to sell!) on any relative subject, at any time, to anyone, whether in the professional associations or societies or not. In this way he might well be a means of stabilizing the number of operators available, operators' technical and operational requirements and standards and, generally, acting as an advisory-pivot (in very much the same way that Lord Netherthorpe guides the professional staff of the N.F.U.). This guidance would undoubtedly, if well applied, be a great help in placing the industry on a sound foundation and, at the same time, disperse the fairly widespread discontent prevailing amongst operators who have made costly journeys into the mysterious realm of aerial farming, with its valuable but very restricted uses.

Sleaford, Lincs. G. N. SNAREY.

[The writer of the above letter has had long experience as an R.A.F. pilot and test pilot (he holds the A.F.C.) and latterly in various executive positions in agricultural aviation concerns. He is now the owner of a general agricultural contracting firm based in Lincolnshire.—Ed.]

FORTHCOMING EVENTS

Dec. 11. R.Ae.S.: Symposium on Flight Safety.
Dec. 11. R.Ae.S. Agricultural Aviation Group: "Aerial Operations Planning in the U.K.," by Peter King.
Dec. 15. Photogrammetric Society: "Alliance of Electronics with Photogrammetry," by P. G. Mott.
Dec. 16. Institute of Metals: All-day Symposium on Powder Metallurgy; and Evening Conversazione.
Dec. 16. Kronfeld Club (with British Women Pilots' Association): Christmas Party.
Dec. 17. Aircraft Recognition Society: December Forum.
Dec. 17. Institute of Aeronautical Sciences: Wright Brothers Lecture, Washington, D.C.
Dec. 17. R.Ae.S.: "Engineering Advantages of Rear Engines in Pure-jet Transports," by E. S. Allwright.
Dec. 29. Institute of Transport (West Middlesex Group): "Air Transport from the Pilot's Point of View," by Capt. O. P. Jones.
Dec. 31. The Science Museum: "The Story of Flight," by Victor Wall.

R.Ae.S. Branch Fixtures (to Dec. 18): Dec. 13, *Chester*, "Parachutes and Parachute Design," by S. B. Jackson. Dec. 14, *Henlow*, Presidential Address, by R. Hills. Dec. 15, *Bristol* (Junior Committee Lecture), "The Supersonic Airliner," by R. G. Thorne. Dec. 16, *Coventry*, film evening; *Preston*, "The Next Generation of Civil Aircraft," by G. H. Lee. Dec. 17, *Isle of Wight*, a.g.m. and film show. Dec. 18, *Weybridge*, annual dance.

THE INDUSTRY

Aiding Flaw Detection

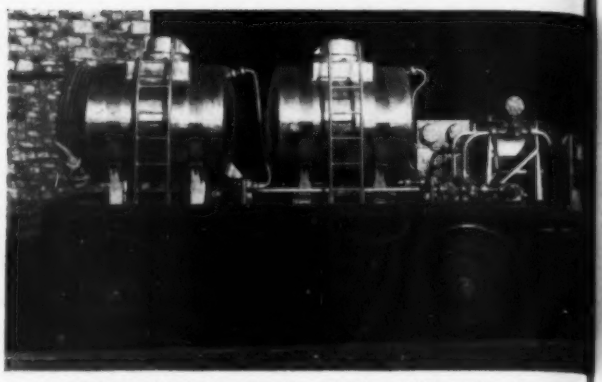
A NEW dye-penetrant technique, carrying A.I.D. approval, has been marketed by Manchester Oil Refinery (Sales) Ltd., 76 Jermyn Street, London, W.1, under the title Verimor (solvent process) dye penetrant process. Developed to facilitate flaw detection of components not attached to large structures, it is capable of achieving a degree of sensitivity (the manufacturers state) "which easily satisfies the stringent requirements for aircraft inspection."

Verimor (S.P.) has been formulated to enable the penetrant to be removed from the surface, but not from the cracks, by dipping the specimen in a trichlorethylene vapour degreaser. Inspection technique is simply to apply the penetrant to the surface and after ten minutes to dip the component in the degreaser for 6-10 sec. (Up to 20 sec may be required for very rough cast surfaces.) Since the component will dry immediately after removal from the degreaser, Devmor (H.F.) developer can then be sprayed on without any time being wasted.

This new method, it is claimed, has several advantages compared with water-washing dye penetrant techniques—including time-saving, ease of testing very rough cast and semi-porous anodized surfaces, and economy.

De-icing by Silicone

AFTER tests by a prominent aircraft manufacturer in co-operation with B.O.A.C., Ambersil Formula I, a silicone fluid which has already achieved wide use in industry, is being recommended for use by aircraft operators to prevent ice formation on passenger and crew entry doors and all emergency exits, and to provide protection for dinghies and similar equipment before stowage, replacing the usual French chalk. Ambersil Formula I, which is already in use on B.O.A.C. aircraft, is in aerosol containers and is marketed by the Amber Chemical Co. Ltd., 11A Albemarle Street, London, W.1. It possesses high lubricity, high heat-resistance (flash point 600 deg F) and low surface-tension. It is stated to be virtually non-inflammable and in addition colourless, non-volatile, water-repellent and chemically inert.



Design of this tanker by Saunders-Roe (Anglesey) Ltd., is based on a careful study of the requirements for handling high-test peroxide efficiently and safely. Mounted on a Dyson trailer protected by a light-alloy drip tray, the two 500 gal tanks are of 99.5 per cent purity aluminium alloy, Argonaut welded and provided with explosion covers of approved design. Driven by a petrol engine, a Filton-Barske pump fuels or de-fuels at 50 gal/min, and safety equipment includes an 80 gal water tank, protective clothing and first-aid kit

IN BRIEF

It was recently announced that Pacitor electronic fuel gauges, developed by Firth Cleveland Instruments Ltd. under M.o.S. contract, had been ordered for the A.W.A. 660.

Simmonds Aerocessories Ltd., a member of the Firth Cleveland Group, have introduced a filter-funnel for use in over-wing fuelling. It incorporates two Fram filter/separator cartridges.

From January 1 next year the name of Birlec Ltd. will be changed to A.E.I.-Birlec Ltd. The name of the Birlec associated company, Birlec-Efco (Melting) Ltd., will not be changed.

In a recent demonstration a B.M. torch, manufactured by Bardic Ltd., William Street, Northam, Southampton, was found to operate successfully after having been submerged for a week at a depth of 30ft in Southampton Water. The retail price of this torch is 35s.

The Aviation Division of the Dunlop Rubber Co. Ltd., 10-12 King Street, St. James's, London, S.W.1, has produced a booklet describing and illustrating the company's new air-cooled brake for aircraft which was exhibited for the first time at this year's S.B.A.C. Show.

The Solartron Electronic Group Ltd. have appointed Mr. Anthony Cockle as reliability engineer. He has been engaged in guided weapon reliability engineering from 1956 until this year with Vickers-Armstrongs (Aircraft) Ltd. and E.M.I. Electronics Ltd.

Two new accessories for use with slotted angle have been added to the Dexion Ltd. list of products. One is a T-section plastic foot, for use with the 140 (1⅜in × 1⅜in angle); and the other is a four-inch rubber castor which can take a load of up to 200 lb.

S/L. Denis Dickson, a director of H. & D. Churchill Ltd., has been appointed general manager. He was previously responsible for home and export sales and before joining the Churchill group of companies was general sales manager of the Gerrard Industries Group.

Scandinavian Airlines System has placed an order, to the value of £24,000, for 78 of the recently introduced 26-man inflatable rubber liferafts made by the R.F.D. Co. Ltd. They will be used on the airline's DC-8 aircraft. This follows the recent news of an Air France order for 84 rafts of this type.

Aircraft-Marine Products (Great Britain) Ltd., have left their offices at 60 Kingly Street, Regent Street, London, W.1, and are now at Amplo House, 87-89 Saffron Hill, E.C.1 (Chancery 2902-8). The new premises house not only the company's head office but also its research laboratory, sales and engineering department, prototype workshops and international trade division.

Several senior staff changes have been announced by Hepworth and Grandage Ltd. Mr. T. L. Booth, formerly director and general manager of Hepworth & Grandage (Yeadon) Ltd., has been appointed a director of the parent company and is to take up responsibility at their main factory in Bradford for the jig and tool drawing office, planning, work study, tool room and machine tool repair departments. He remains on the board of Hepworth & Grandage (Yeadon) Ltd. Mr. H. Forrest, director and works general manager of the main factory at Bradford, has been appointed to the board of Hepworth & Grandage (Yeadon) Ltd.; and the general managership of the Yeadon factory, previously the responsibility of Mr. Booth, will now be taken over by Mr. A. Rowntree, assisted by Mr. E. Boyes.

Venner Accumulators Ltd., Kingston By-pass, New Malden, Surrey, have produced a new catalogue illustrating and describing (by means of photographs, drawings and data tables) their range of lightweight silver-zinc accumulators.

Gold-film windscreens of a greater curvature than has previously been possible are to be produced in a new plant planned for the King's Norton, Birmingham, factory of the Triplex Glass Co. Ltd. Triplex gold-film glass, in which a microscopically thin film of pure gold is applied to the glass, is used to prevent the misting and icing-up of windscreens of high-performance aircraft.

At a meeting of directors of the Northern Aluminium Co. Ltd. recently the board accepted the resignation of Mr. C. P. Paton, who is taking up a position with Aluminium Ltd. of Canada in Montreal. At the meeting Mr. T. Cornelius, who has taken over from Mr. Paton as general works manager, was elected a director of the Northern Aluminium Co. Ltd. He was until recently a vice-president of the Aluminium Co. of Canada Ltd.

Henry Wiggin & Co. Ltd., Thames House, Millbank, London, S.W.1, have published a new booklet, based on an article in our associate journal *Aircraft Production* (and reprinted by permission of the editor) on *Welding Nimonic Heat Resisting Alloys for Gas-Turbine Assemblies*. It contains tables showing specified compositions, physical properties, recommended heat-treatments and appropriate welding materials (filler wires, fluxes and electrodes) for nimonic alloys.

The Plessey Co. Ltd. have announced that under their policy of expansion and consolidation in the Swindon area, Amar Tool & Gauge Co. Ltd., of Chadwell Heath, Essex, will now be grouped for administrative purposes with the company's Industrial Hydraulics and Sheet Metal Division at Cheney Manor, Swindon, under the overall management of Mr. E. H. Y. Burden, M.I.Prod.E. Mr. Burden joined the Plessey Co. in 1956, subsequently becoming general manager of the Amar Tool & Gauge Co. Ltd.

An agreement is shortly to be concluded between the Timken Roller Bearing Co. and the Fafnir Bearing Co. of New Britain, Connecticut, U.S.A., by which a recently formed subsidiary of the latter, Fafnir Bearing Co. Ltd., is to purchase the business of Fischer Bearings Co. Ltd., Wolverhampton, a Timken subsidiary. The sale of the Fischer Co., which was until recently owned by the former British Timken Ltd., results from a Timken decision to confine their interest to the manufacture of tapered roller bearings throughout the world.

Mr. W. G. C. Denny, A.M.Brit.I.R.E., Assoc.(S.A.)I.E.E., has been appointed technical sales manager of the Telecommunications Division of Elliott Brothers (London) Ltd. at Borehamwood. During the war, when a radar officer in the R.N.V.R., he was Radar Liaison Officer on the staff of the Director of Radio Equipment at the Admiralty headquarters in Bath. Since the war he has been in South Africa heading the telecommunications and electronics division of a company there and handling the interests of several British companies in similar fields.

Scottish Aviation handed over five P. & W.-powered Twin Pioneer Series 2s to Philippine Airlines on November 27. Scottish Aviation crews will ferry them to Manila. Mr. T. D. M. Robertson, managing director of Scottish, who performed the handing-over ceremony, is sixth from the left in this Scottish Aviation and P.A.L. group

AIR COMMERCE

TOWARDS COMMONWEALTH PARTNERSHIP

AS this page closed for press it was learned that the long negotiations for a tripartite pool among B.O.A.C., Qantas and Air-India had been successfully concluded in Bombay. On behalf of the three Commonwealth partners Air-India issued the following statement (abridged here):—

"India, Great Britain, and Australia have reached agreement today to co-ordinate their operations in a drive to expand their share of the world's international air traffic in the jet age. Details of the agreement have to be ratified by the airline's boards and Governments. Assuming ratification, the agreement will come into force on April 1, 1960. Tickets of the three airlines will be freely interchangeable and each airline will sell the services of the others. Each airline will retain its own identity and individuality . . . [and] will also continue to exercise its right to choose the best aircraft for its purposes in its own judgement."

The network involved expands from London eastwards to India, Australia, Hong Kong, and Japan, and westwards from London to New York, "and thus covers a very large part of the world's air transport system."

ALLEGHENY EQUIPMENT PLANS

THE purchase by Allegheny Airlines of 11 Convair 340s, along with plans to place on the market most or all of its present fleet of Martin 2-0-2s and DC-3s, marks the start of a major turnover in the airline's equipment. As recorded in *Flight*, November 20, five Eland-powered Convairs are to be operated by Allegheny and an option has been taken on engines for an additional ten Convair 540s. These first five airframes include the present 540 leased from Napier, and four converted from the 11 Convair 340s—aircraft traded-in to Lockheed by National and now being purchased by Allegheny.

The balance of seven piston-engined Convairs may well be retained for operation on the ultra-short haul commuter services (such as the 92-mile Cleveland - Detroit route) for which Allegheny have applied to the C.A.B.; if they are, Allegheny's Convair fleet could eventually number 22. Conversion of a first 340 should begin next week and that of the second aircraft in March.

Included in the conversion cost of around £210,000 are weather radar, an integrated flight system and automatic pilot, and various modifications to the interior including installation of 52 seats. One reason given for Allegheny's choice of the Convair 540 is that because full payload range is in excess of 500 miles Allegheny can take advantage of the wide differential in the price of aviation fuel across its system; this is as much as 2:1.

Some new figures have now been given for operations in September, the last month in the first trial period. Direct operating costs were 94.5 cents per aircraft mile (compared with $1.03 per aircraft mile in July) and revenue was $57,511 or $1.7 per aircraft mile. For comparison the Martin 2-0-2 earned $1.72 and the DC-3 $1.24, but at an average revenue per passenger of nearly $20, the 540 was substantially ahead of the Martin and the DC-3 (respectively $13.7 and $10.4).

EAGLE'S 3,800-hr DC-6C

IN its first full 12 months of operation, DC-6C G-APOM of Eagle Aviation recorded a utilization of 3,804 hours. The Air Registration Board has confirmed Eagle's belief that this is a record for a British-registered aircraft. The previous full-year utilization record is believed to have been held by a B.O.A.C. Argonaut: G-ALHD flew 3,597 hr in calendar 1955.

Eagle took delivery of G-APOM on August 8, 1958, with 27 hr in the log book. It was new off the Douglas production line (being one of the last piston DCs delivered), and after interior conversions the 3,804 hr were recorded in the period October 7, 1958, to October 6, 1959, in the course of operations on the following kinds of work:—

Air Ministry trooping on scheduled services from the U.K. to Aden, Nairobi and Nicosia. These contracts expired in September 1959.

Air Ministry "ad hoc" charters carrying passengers and freight from the U.K. to Christmas Island, Gan (Maldives), Negombo, Hong Kong, Adelaide, Bombay, Aden, Bahrein, Nairobi, Nicosia, Teheran, New York, Kingston and Malta. These ad hoc contracts continue to be carried out regularly.

Commercial charters from the U.K. to Basle, Zurich, Kuwait, Paris, New York, Buffalo, Bradley Field, Amsterdam - Teheran, Keflavik, Tel Aviv - New York, etc. (continuing).

Scheduled passenger services from the U.K. to Rimini, Pisa, La Baule, Dinard (continuing, with next season the addition of Innsbruck).

Assuming that its revenue rate was not less than £240 per hour, G-APOM must have earned about £900,000 from its revenue flying in the 12 months concerned. So far as reliability went, Mr. D. Peacock, director of Eagle Aircraft Services, says: "The aircraft was only A.O.G. on one occasion during the period under review, but it fulfilled all its commitments."

Eagle have two other DC-6Cs, G-APON and G-APSA, delivered respectively on September 4, 1958, and January 24, 1959, with 8,980 hr and 212 hr in their log books. G-APON was off service for six weeks last summer for an inherited 12,000 hr check, otherwise it might have achieved 3,800 hr or more in its first year instead of the actual 3,366 hr. In its first six months G-APSA achieved 1,758 hr; it should reach about 3,750 hr.

Check cycle for the DC-6C was 2,500 hr, comprising up to October 1959 ten "equalized" maintenance checks per cycle of 250 hr and a certificate-of-maintenance check each 125 hr. Since then the cycle has been increased to 3,000 hr, with ten equalized maintenance checks of 300 hr and c. of m. checks of 150 hr. Approved life of the P. & W. R-2800 CB17s is 1,600 hr, with Eagle conducting trial extensions to 1,700 hr.

Eagle have nothing but praise for their DC-6Cs after their first year's experience of the aircraft. They now look forward to using them on scheduled V.L.F. services, when these are approved. In the meantime, as noted last week, Eagle are finding additional work for the aircraft by offering V.L.F. charter flights to the public: one is planned this month, and another next month, to Bermuda at a fare of £124 compared with the normal tourist return fare (via New York) of £218.

THE HERALD'S TOUR CONTINUES

HANDLEY PAGE are continuing with their most intensive series of demonstrations with the Dart Herald; more than 40 countries have been visited. The aircraft on a 30,000 mile tour of Australasia has just completed what is described as "a very impressive visit" to New Guinea where it was flown into the most difficult of the country's small grass airfields. All of these are at altitudes of 5,000ft and above with short, sloping runways between 3,800ft and 4,250ft long. At Goroka and Mount Hargon only uphill landings and downhill take-offs can be made and at the 6,500ft altitude airfield at Wabag—one of the highest to be visited—braking was necessary to prevent the Herald rolling backwards at the end of its landing run.

These were the first turboprop demonstrations ever to be made at these aerodromes and, say Handley Page, local pilots expressed considerable surprise at the ability of the Dart Herald to climb another 500ft when an engine was cut at an altitude of 12,500ft.

Another Dart Herald demonstration was made to Nice on December 3 by the first production aircraft, G-APWA. It was demonstrated to Mr. Aristotle Onassis of Olympic Airways and on the return flight to London, Mr. Onassis was accompanied by Prince Rainier and Princess Grace of Monaco. Olympic's present DC-3 fleet, for which the Dart Herald is being considered as a replacement, consists of 14 aircraft.

ARGOSIES FOR AAXICO?

THE all-cargo airline Aaxico of Miami is contemplating the purchase of two AW.650 Argosies. This was stated by the president, Mr. Howard J. Korth, before the C.A.B. Examiner in recent hearings on the domestic cargo/mail services case. Aaxico would not, he said, purchase any new aircraft without first test-operating the type over its routes: this it planned to do with the Argosy immediately. Price quoted to Aaxico, according to the airline, was about $1.5m each (£535,000).

An Armstrong Whitworth spokesman was last week unable to confirm that an Argosy would, at this stage, be made available to Aaxico for route-proving tests.

Hands up all those who thought the aircraft in these two pictures were Boeing 707s

AIR COMMERCE . . .

IMPROVING THE BREED

OVER a year ago *Flight* forecast that the next round of airliner financing would be the new technical advances such as turbofan conversion kits, super circulation or flap-blowing, and area rule (October 3, 1958, page 543). The turbofan conversion programme is now well and truly launched, and it is conceivable that most of the operators of big jets will sooner or later convert to turbofans, the improved economy of which is estimated to outweigh the cost of conversion by a considerable margin. It is also likely that *new* customers will specify powerplants of the divided flow type, either the P. & W. or G.E. turbofan conversions, or the Rolls-Royce by-pass jets.

Now it is reported that Pan American intend to convert all their 23 Boeing 707-320 Intercontinentals to turbofan power by 1961. And Mr. Don Finlay of Boeing says that he expects all 707 carriers eventually to switch to turbofan engines.

Meanwhile it seems that flap-blowing may not be so far off. Boeing have already fitted the "Dash Eighty" 707 prototype with a boundary layer control system for flap-blowing. An estimated 10 per cent improvement in take-off performance is claimed, the system being supplied by air bled from the engine compressors. Boeing will not yet commit themselves to talking about a "retrofit" programme until tests have been completed, but it seems reasonable to prophesy that such a device, conferring high lift benefits to ease weight-limited take-offs, may prove as attractive to operators as the turbofan programme. No doubt Douglas and Convair are studying flap-blowing systems also.

Area rule is perhaps not likely to be offered as a "retrofit," though the Convair 600 is a good example of an area-rule modification made on the production line, and which has so far tempted four Convair 880 customers to switch to the faster Convair 600s. Though the Boeing 720 "speed wing" is hardly an area-rule modification, it is a change which confers higher speed, and which can be made (and is being made by American Airlines) retrospectively.

We are seeing now the beginning of a trend towards improvement of the breed. Today's 707s and DC-8s will be developed just as was the basic DC-4 into the DC-6B. The airline industry will find the financing of these improvements worthwhile so long as it remembers the lesson of the DC-7 and the later Super Constellations. These were manifestations of "quality competition" and of the demand for higher performance rather than improved economics.

A NEW AIRPORT FOR IRELAND . . .

THE Irish Department of Transport and Power has announced that a contract for the construction of runways, taxiways, apron and terminal buildings at Cork Airport has been awarded to a Dublin civil engineering firm.

The new airport will be built on a 150-acre site at Ballygarvan, seven miles south-east of the second largest city in the Republic. The project is due to be completed in 1961 and will cost £1 million. It is proposed to lay two runways, the main one 4,500ft long and the subsidiary 3,800ft long.

QANTAS PAYS ITS WAY

SO much has appeared of late about last year's sad performance by B.O.A.C. in the economic sphere that it is interesting to see how the Corporation's even longer-haul partner, Qantas, fared over the same period.

The only feature common to both carriers was a sharp fall in load factor, in the case of Qantas this figure having dropped from 58 to 56 per cent. But whereas B.O.A.C. cut their costs sharply, the Australian airline only managed to shave a small fraction of one per cent off its cost level. Yet the curious thing is that Qantas experienced only a slight fall in profit compared with B.O.A.C.'s heavy losses. The reason for this discrepancy lies in the fact that whereas the Corporation's average revenue rates were reduced by the inroads of low-fare economy-class traffic, Qantas enjoyed substantially improved revenue rates. Indeed the increased rates virtually compensated for the fall in load-factor. This revenue improvement was partly due to increased passenger fares, but another important factor was a sharp increase in mail rates (from 124 to 139 pence per l.t.m.). Although this company's reports do not refer to mail payments, there are few airlines which do so well out of their local post office. If Qantas mail rates were reduced to the level obtained by most other airlines, then there would be little possibility of showing any profit. It is a moot point whether or not Qantas should be considered to be on subsidy.

Although the Qantas route network of 73,000 miles is almost as extensive as that operated by B.O.A.C., in terms of operations the Australian airline is about one-third of the Corporation's size. Revenue in 1958 reached almost £24 million (compared with £60m-odd for B.O.A.C.) while staff strength stood at 6,000 (B.O.A.C., 19,000).

In one final respect, Q.E.A. compares very favourably with the Corporation: no additional capital is being raised to finance the purchase of new equipment. Rather more than half the £29 million required for seven 707s and four Electras will have come from the airline's own reserves, the balance being in the form of short-term loans. This means that Qantas will not be burdened by a top-heavy capital structure once the jets come into full operation.

INDEPENDENTS' IRISH ASPIRATIONS

DURING the recent Aer Lingus grounding U.K. airlines continued to operate into Dublin, and the strike highlighted the recent independent applications to operate new services there.

B.K.S. Air Transport propose to operate a vehicle ferry service, using Bristol Freighters, between Liverpool and Dublin at a frequency of up to ten flights daily. B.K.S. estimate that they would carry 3,000 cars into Dublin during the first year of operations and that flight time would be 50 minutes between the two airports. The project, which has been studied during the last six months, has the full approval and encouragement of the Irish Tourist Board.

Starways are proposing to start a service between Liverpool and Dublin using Douglas DC-3 and DC-4 aircraft in direct competition with Aer Lingus, which has hitherto had a monopoly of the route. During 1958-59, the Irish airline, which operates Fokker Friendships on this route, carried 37,632 passengers between Liverpool and Dublin. Four other independents—Derby

Hands up all those who thought the aircraft in these two pictures were Douglas DC-8s

Aviation, Claydon Aviation, Jersey Airlines and Orion Airways—have applied to operate services to Dublin from Anglesey, Derby, Coventry, Exeter and Luton. At present, only two British independent carriers operate services into Dublin: B.K.S. Air Transport from Newcastle, using Airspeed Ambassadors (Elizabethans), and Leeds/Bradford, using DC-3s; and Silver City from Blackpool, in pool with Aer Lingus, using DC-3s.

NEW AIRWAYS FOR EGYPT

IN accordance with I.C.A.O.'s Mediterranean/South East Asia regional air navigation plans, new airways are to be established in the Cairo and Bahrain Flight Information Regions, where only advisory routes existed before.

They will come into force at 0001 hr on January 1, and will extend the continuous run of the great airway Amber One. From Skipness in Kintyre, Argyle, Amber One passes through Prestwick, London, Paris, Nice and Elba to Cantanzaro in southern Italy. Here it becomes A.D.R. 314 for its passage through Greek national airspace and resumes again as Amber One when it enters the Cairo F.I.R. It then runs just south of Aqaba and becomes A.D.R. 433 for the sector leading to the boundary of the Bahrain F.I.R. At this point it renews its existence again as Amber One and runs through Bahrain and Sharjah to Karachi. From here it will eventually run through to the Far East.

Similarly, Green Eight will be brought into force in the Bahrain F.I.R. on the first day of next year and this airway will eventually run from Cantanzaro through Athens, Beirut, Bahrain, Sharjah and Bombay, and penetrating eventually into South-East Asia.

In the new Bahrain scheme, for the first time reporting points will depend upon altitude. Aircraft flying below Flight Level 290* will have to report at every reporting point *en route*, whilst for those above this level reporting points will be fewer. Another innovation is the requirement for filing a flight plan irrespective of weather conditions or time of day for every flight or part of a flight above Flight Level 150. Control zones are also introduced at Sharjah and Doha for the first time.

B.O.A.C. AND IRAQI AIRWAYS

BOTH Britain and the Soviet Union have offered Iraqi Airways modern aircraft and technical advisors to train Iraqis in their handling, it was reported last week from Baghdad. The British offer to negotiate a new agreement with the Iraq Government was discussed with B.O.A.C. representatives in Baghdad, and a committee has been formed to study both countries' offers.

Under an agreement made in 1945, and due to expire on January 31, 1960, B.O.A.C. have been giving technical advice and assistance to Iraqi Airways. Last February Iraq informed B.O.A.C. that it wanted to terminate the agreement. According to a Reuter message from Baghdad on November 29, Mr. Mohammed Ruf of Iraqi Airways said that the talks "were on Iraqi's proposals"; the British side would consult with the B.O.A.C. Board "before the projected agreement is signed."

**29,000ft on an altimeter set to I.S.A. standard pressure (1013.2 mb).*

CIVIL AVIATION IN AFGHANISTAN

THE recent accident in Beirut to an Afghan Ariana Airlines DC-3 brings to the public eye the mountain kingdom of Afghanistan and the emergence of the airline on international traffic routes. Up to May 1957, Afghanistan, sandwiched between Russia and Pakistan, and tucked away on the roof of the world, had to rely upon Indian and Persian airlines to carry her passengers abroad.

Following negotiations with Pan American, in 1957 an Afghan Civil Aviation Authority was established and domestic scheduled flights began with four DC-3s. During the latter part of 1957 two DC-4s were added and the DC-3s sent to England for modernization. Five Afghan pilots received primary flight training at Old Kandahar (West Afghanistan) Airport and were later sent to Parks Air College, Missouri, for intensive instruction. A further class of five trainees and six maintenance technicians are now in the United States undergoing advanced training. It was appreciated that an efficient air transport system must be backed up by continuous training and the Air Authority has set up a school where 200 students receive instruction in every aspect of flying.

In order that Afghanistan should have efficient landing facilities Kandahar will be the first Afghan airfield to be brought up to international standards. Jointly financed by the Afghan Government and the International Co-operation Administration of the United States, it has been planned and designed by the U.S. Federal Aviation Agency.

The runway will be 10,500ft long with a 1,000ft overrun at each end; 20 inches of carefully selected and blended materials underlie a bitumenous concrete wearing surface and moisture seal.

The runway, taxiway, international-flight terminal apron, hangar apron and runway lighting are now nearly complete. A modern feature of the runway-taxiway system is the high-speed turn-offs. Since Kandahar has been designed with intercontinental jets in mind a 30 degree turnoff with a second 60 degree turnoff into the taxiway has been incorporated.

The 150ft high non-directional beacon erected at Kandahar is duplicated in Herat, Kabul, Kunduz and Jelalabad which airfields, although at the moment not up to international standards, will soon be modernized to accommodate the largest aircraft. Nearly half a million pounds' worth of communications and navigational equipment has already been installed and 25 60ft high radio transmitting masts are nearing completion, so that a network of let-down facilities will eventually cover all major airports in the country.

Afghanistan aims at replacing foreign technical staffs with nationals as soon as the latter are sufficiently trained. At the moment Ariana flies as far west as Frankfurt, north to Tashkent, and east to Bombay. It is hoped in the near future to equip the line with Constellations and eventually with Boeing 707s.

The recent crash, first in Ariana's history, is a sad affair for Afghanistan but it will only make her more determined to plan well and establish an international airline in every sense.

AIR COMMERCE . . .

Shipping: The Decline Begins

BOARD OF TRADE statistics for the first half of 1959 suggest that inroads into shipping traffic caused by airlines are resulting in a decline at a time when foreign travel is on the increase.

FUTURE historians might well ask why the shipping industry reached its zenith in 1957 and thereafter began to decline. The answer would lie in the introduction in the following spring of economy-class air services across the North Atlantic. Although sea traffic on the long runs to Australasia and South Africa continued to expand slowly into the early 'sixties this was only because of the airlines' remarkable reluctance to bring in really competitive fares on these routes. The folly of their ways was shown when the airlines eventually agreed to introduce a £210 economy fare between London and Sydney; there then began a massive diversion of traffic from sea to air the like of which had not been since 1958 and 1959 on the North Atlantic. The only shipping routes which continued to expand into the late 'sixties—albeit at a slow rate—were the short cross-Channel services between Britain and the Continent. This reflected the growing popularity of foreign travel among manual workers. But by 1970 the air fares even on these routes had fallen below those for the cheapest surface travel, and shipping traffic then fell away rapidly.

Recent statistics compiled by the Board of Trade and the Ministry of Aviation provide the basis for this prophesy. These can be used to show that airlines now carry, on a passenger-mile basis, more traffic in and out of Britain than all the shipping companies put together. Measured in the more usual but less meaningful terms of number of passengers, the airlines' share stands at 46 per cent of the total. This share has been increasing steadily except in the recession year of 1958; if recent trends continue it seems certain that by 1961 the airlines will be carrying more passengers in and out of this country than the shipping lines.

TRAFFIC TO AND FROM GREAT BRITAIN

	Total passengers in thousands Jan-June		
	1957	1958	1959
Continental:			
Sea	1,340	1,474	1,554
Air	1,131	1,178	1,311
Total	2,471	2,652	2,865
Irish Republic:			
Sea	467	482	458
Air	164	170	197
Total	631	652	654
Channel Isles:			
Sea	106	95	91
Air	186	167	182
Total	292	262	273
Intercontinental:			
Sea	311	284	275
Air	282	304	338
Total	593	587	613
All routes:			
Sea	2,225	2,335	2,378
Air	1,763	1,819	2,027
Total	3,988	4,154	4,404
	Air Traffic as percentage of total traffic		
Continental	46	45	46
Irish Republic	26	26	30
Channel Isles	64	64	66
Intercontinental	48	52	55
All routes	44	44	46

The Board of Trade distinguishes between four sets of routes radiating out from this country—these lead respectively to the Continent, to the Irish Republic, to the Channel Islands and "elsewhere." As is so often the case with statistics, the balancing item is the most important. Each of these four categories shows a marked defection of traffic from sea to air. Indeed in three cases out of four the shipping traffic has dropped at a time when the market as a whole has expanded.

The Continental routes provided the only instance of surface traffic actually increasing, although at a humble 5 per cent (this at a time when climatic and economic conditions were probably ideal). Over the same period, the airlines' traffic rose by 11 per cent, their share of the total increasing from 44 to 46 per cent. The actual figures for total passenger movement in both directions were shipping lines 1¼ million, airlines 1¼ million. By 1962, and possibly even by 1961, the airlines should overtake the shipping lines at about the 1¾ million passenger mark for the first half year. Within a few years of that date it is likely that the shipping total will actually start to decline. On a passenger-mile basis the airlines have already overtaken the shipping companies on these Continental routes, although in this case the comparison is somewhat unfair on surface carriers which are not amphibious.

Although the Channel Island and Irish Republic routes look important when measured in numbers of passengers, the distances involved are so short that traffic is slight when compared with Continental services. Channel Island traffic is peculiar in that it appears to be suffering a long-term decline. And unless landlords and landladies in Jersey and Guernsey show a little more enthusiasm for the unsophisticated inclusive-tour traveller, this decline is likely to continue. Sea services have been bearing the brunt of this decline so far, and as a result the airlines now carry two-thirds of the traffic to and from these islands.

On routes to the Irish Republic the airlines are rapidly increasing their share of a gently rising market. Only a few years ago this share stood as low as one-quarter. Today the proportion is approaching one-third. Although the shipping services continue to carry the bulk on these relatively low-income routes, their share is falling in both absolute and relative terms.

TRAFFIC ON INTERCONTINENTAL ROUTES*
(Passengers in thousands, January-June)

	1958		1959		Air as % of total	
	Sea	Air	Sea	Air	1958	1959
East Africa	5	15	6	16	72	73
U.S.	88	138	78	163	61	68
West Africa	10	17	10	20	64	67
India/Pakistan	11	19	10	18	64	63
Canada	47	45	41	48	49	54
Caribbean	11	9	9	8	46	48
Malaya	9	6	8	7	41	46
Latin America	5	1	5	3	16	34
South Africa	30	7	29	7	19	18
Australasia	52	3	58	4	6	6

* Listed according to share of traffic moving by air.

But for shipping companies and airlines these short routes are small fry in comparison with the long-haul routes stretching across the Atlantic and beyond Europe. And it is on these routes in general that the shipping lines are facing their most damaging competition. For a number of years their total traffic has been falling whereas the airlines have been doing progressively better. This trend has been most noticeable on the North Atlantic. Over the first half of this year, sea traffic fell by 11 per cent compared with the same period last year. This was at a time when total traffic rose by 4 per cent. The same story of "sea traffic down-air traffic up" was repeated on most of the other long-haul routes with the striking exception of that to Australasia. It is of course no coincidence that an unusually large proportion of total traffic on this route consists of people paying their own way; and that the present level of air fare lies well beyond most pockets.

The long-haul shipping statistics are broken down to show various classes of traffic. A number of points emerge:—

(1) Outward migration by sea has dropped sharply in total despite a rise in immigration into Australia. This is because a slowing down in the general level of migration away from Europe has been accompanied by the introduction of special air rates for emigrants.

(2) Inward migration by sea has been virtually static; an increasing number of immigrants into the U.K. from Australia, New Zealand, Malaya and Southern Africa has been offset by a sharp fall in the number of arrivals from the West Indies.

(3) Incoming visitors from abroad, the majority of whom are from the Commonwealth, are increasingly choosing to fly rather than go by sea. The only important exceptions to this are the unfortunate Australians and South Africans who cannot in the main afford the present uncompetitive air fares.

(4) The only other people who fail to conform to this general pattern of switching from sea to air are the British. While immigrants and overseas visitors in general are abandoning long-haul shipping services, Britons cling loyally to their merchant marine. The North Atlantic routes provide the only significant exception to this rule. But this case was unusual insofar that travellers paying their own fare had the unique opportunity of flying at less cost than if they were going by sea.

In the light of these facts, the prospects for long-haul passenger services by sea are indeed gloomy. Immigrant traffic, which still accounts for about a third of the shipping total, will almost certainly continue to drop steadily; on the one hand, air fares will be increasingly competitive; and on the other, rising living standards in Europe will slow down the whole volume of migration. One-half of total shipping traffic is represented by people coming to visit this country from abroad; these travellers will patronize the long sea services in gradually reducing numbers, their allegiance being steadily transferred to the airlines. And, finally, the number of Britons travelling abroad by sea will rise slowly for a year or two more until sensible air fares are made available on the intercontinental routes. Then the shipping share of this sea-conscious market will start to dwindle rapidly. J. C. S.

Now operating in the colours of Silver City are the company's five Manston-based Hermes. They were previously in Britavia markings

AIR COMMERCE . . .

FRIENDSHIPS FOR I.A.C. AND OTHERS

OF the ten Fokker Friendships to be bought by Indian Airlines, five are to be bought immediately and five possibly in 1961. Negotiations for the purchase of the first five aircraft are in progress with Fokker on the basis of what is reported to be a barter arrangement. India will supply, as already briefly reported in *Flight*, manganese ore to Dutch commercial interests, the accruing foreign exchange being used for the purchase of the Friendships.

The three further Viscounts which Indian Airlines are reported to be about to acquire are, it is believed, likely to be purchased from Union of Burma Airways—an airline which, in turn, is also planning to buy Friendships.

There has been some confusion as to the distribution of the 12 Friendships purchased by T.A.A. The Australian journal *Aircraft* reports that one of the six RDa.7-powered versions in the T.A.A. order has been bought by Mac.Robertson-Miller Airlines, with the financial assistance of the Australian Government. This followed an earlier decision by East-West Airlines of Tamworth, N.S.W., to take delivery of another of the RDa.7-powered Friendships delivered to T.A.A. In the airline's colours, this aircraft was delivered direct to E.W.A. from Schiphol, and it is now in service on E.W.A.'s network. The aircraft is under charter from T.A.A. for at least 12 months and it is believed that E.W.A. have an option to purchase at some stage if they wish. The airline has so far been refused an import licence for a second Friendship.

The big mining and industrial concern, Broken Hill Pty., is also acquiring one of T.A.A.'s Friendships—it is understood that it is an RDa.7 version—for executive use. Of the six Friendships (RDa.6) ordered by Ansett-A.N.A., some are to be allocated to both Butler Air Transport and Queensland Airlines, and it is likely that some of these aircraft will also be operated on the routes of Guinea Airways, now an Ansett subsidiary.

All these deals have the sanction of the Australian Civil Aviation Minister, Senator Paltridge, who has said that T.A.A. were permitted to order their second batch of six Friendships because they had an option to purchase at a favourable price and it was considered that this benefit should be made available to the small airlines if they so desired. The condition of T.A.A.'s permit was that if the airline did not need all the aircraft for its own use the surplus should be made available "in appropriate circumstances to selected feeder operators" at the price T.A.A. paid for them. In the case of E.W.A. and Mac.Robertson-Miller training has been provided by T.A.A., who will also undertake overhauls.

BREVITIES

Nominations for the Guild of Air Pilots and Air Navigators awards for 1959 should reach the Guild's office at 14 South Street, Park Lane, London, W.1, not later than January 8, 1960.

The Irish charter company Skycraft has taken delivery of a Bristol Freighter for passenger and cargo operations, and the company plans to acquire a second aircraft of this type next year.

The proposal by Varig Airlines that they should co-operate with L.A.V. in the operation of their two Boeing 707s (*Flight*, October 23) has not been approved by the Brazilian Government.

B.O.A.C. will extend its Comet 4 services next February from New York to Nassau and Montego Bay. Six weekly services will be operated, including three direct flights to Jamaica and three to Jamaica via Nassau.

The Blackbushe Airport Tenants' Association have decided to abandon their efforts to prevent the airport from being closed. New reasons for the airport's closure have apparently been given by the Minister of Aviation.

B.O.A.C.'s Comet 4 services to Johannesburg were inaugurated on schedule on December 2. There are to be four services per week between London and Johannesburg and the 22 hr 15 min schedule of the Britannias—which will now be superseded—is cut to 17 hr 30 min.

Pre-operational and development expenditure by B.O.A.C. and B.E.A. during the six months ended September 30, 1959, amounted to about £835,000. This was stated by Mr. Duncan Sandys in a Written Answer on November 24. Types concerned are the Comet 4 and the Vanguard.

Load factors have been so low on the experimental off-peak economy fare (3d a mile approx.) offered between New York and Miami that National Airlines, Eastern and Northeast have all sought permission from the C.A.B. to cancel it.

Pan American reports that it completed its first year of 707 operations with only one unscheduled JT3 change per 2,700 flying hours, compared to one per 993 for DC-7s. There was one actual engine shut down for every 11,000 hours; comparable figure for the DC-7 series was 1,315 hours.

October 1959 was the historic month in which U.S. airline load-factors were less than in the corresponding month of the previous year—59.35 per cent compared with 60.22 per cent. This is the first indication that the very high jet load factors achieved in the first year of jet operations are now becoming more realistic as more jet capacity is made available.

Studying S.A.S. Caravelle operations has been the engineering team of United Air Lines which recently visited the Sud Aviation factory at Toulouse. If purchased by United, the Caravelle might be powered by G.E. CJ805-23 turbofans. Negotiations are at present in progress between Sud and G.E. for a Caravelle test installation to be carried out at Republic's Farmingdale base, though no definite decision has get been reached.

Sabena have been granted a credit of £7.15m by the ExIm Bank for the purchase of their five Boeing 707-320s. *Aviation Daily* reports that the Bank will assume £4.3m of the credit, seven commercial banks will guarantee payment of £2.14m, Boeing and United Aircraft will guarantee £357,000 each. The credit is spread over a seven-year period. Sabena will get their first 707s in December; the others will follow in January, February, May and June 1960. Thirty-five airliners have been financed with the assistance of the ExIm Bank.

It is reported that Loide Aereo of Brazil is considering the purchase of three or four Electras, and is planning to offer DC-6Cs as down payment.

A deputation from south-west Lancashire is to ask to see the Ministers of Transport and Aviation to request that Burtonwood, near Warrington, is established as an international airport.

Chicago Airways has ordered six 25-passenger Sikorsky S-61s (two G.E. T58-3s of 1,250 s.h.p. each) for service in 1961. The price was given as "about $650,000" per aircraft.

A new edition of *Approved Airport Lighting Equipment* has been published by the American Federal Aviation Agency. It is available from the F.A.A. Regional Administrator, New York International Airport.

As forecast in *Flight* for November 27 Tradair have purchased two Viscount 707s from Aer Lingus. From January next year they will be used on a new scheduled service to Budapest and Bucharest and for charter tasks. They will replace Vikings on longer inclusive tour flights.

It is reported that Trans-Caribbean Airways will change its name to Transportation Corp. of America. The company will probably continue to advertise as Trans-Caribbean Airways, though tickets and aircraft would carry the new name. The airline has one DC-8 on order.

Caravelles were introduced on to the S.A.S. route to Dharan in Saudi Arabia on November 25. S.A.S. Caravelle services between London and Copenhagen, Stockholm and Oslo will be inaugurated on April 1 next year, subject to government approval of noise characteristics.

A Martin 2-0-2 of Allegheny Airlines crashed near Williamsport in Pennsylvania on November 30. It was on a flight to Cleveland from Philadelphia. It missed an approach in a snow storm and the wreckage was found half way up Eagle Mountain. There was one survivor among the 22 passengers and three crew members on board.

Last week a Ministry of Aviation official declined to make any comment on a newspaper report that a conference of Commonwealth airlines was being planned for next spring by Mr. Duncan Sandys. The conference, to take place in London, was said to be aimed at setting up a council to develop Commonwealth air transport.

Just published by Max Parrish & Co. Ltd., of 55 Queen Anne Street, London, W.1, is a beautifully produced volume, edited by Barbara Cooper, *The B.O.A.C. Book of Flight*. Among the contributors are Captains T. B. Stoney, B. C. Frost and Lincoln Lee of B.O.A.C., Robert Blackburn of Vickers, Harry Hensser, Trevor Hill and T. I. Pyle. The price is 16s.

Hughes Tool Company, which has 12 707-320s and 30 Convair 880s on order, has sought C.A.B. approval to lease the 707-320s to T.W.A. at a rate of $2,940 per day, and the 880s at a rate of $2,070 per day. The arrangement is similar to the one whereby T.W.A. leases its 707-120s from Hughes Tool pending completion of T.W.A.'s jet financing programme. These -120s, T.W.A. report, are now operating at a utilization of just over ten hours per day per aircraft.

The DC-8 which Hawaiian Airlines will lease from Douglas (the prototype aircraft) will be rented for a period of 84 months from October 1, 1961. Hawaiian will pay Douglas $50,000 for the right to lease, this sum being applied to the purchase of two further new DC-8s if the present option is exercised. Current price of the JT3D-1 turbofan powerplant for Hawaiian's DC-8s is now about £69,500, and the price of the JT3D-3 turbofan is £72,500.

SERVICE AVIATION

Royal Air Forces and Naval Flying News

S/L. Peter Latham, C.O. of No. 111 Sqn., with the new croquet set presented to the squadron at Wattisham by Mr. Erick Barnett (centre) to replace the "battered" equipment seen in their recent documentary film. On the right is F/O. F. Hymans, one of Treble-One's pilots

Second Britannia Squadron

A SECOND Britannia squadron is being added to R.A.F. Transport Command, with the re-formation at Lyneham next Tuesday of No. 511 Sqn.

This squadron, disbanded in September last year, had a distinguished record in Transport Command from 1942 onwards. It is to be commanded in its new existence by W/C. A. W. G. Le Hardy and on Monday next its original badge is being handed over by Air Chief Marshal Sir Frederick Bowhill (Ret.), who was the first A.O.C-in-C. of Transport Command. Like those of its sister squadron, No. 99, the Britannias of No. 511 will be named after stars.

In its previous existence, the squadron won the Berlin Air Lift Gold Cup in 1955. Lyneham was its first base and it flew a regular mail service, first to the Near East and then to North Africa and India. At the time of the Berlin air lift it was operating with Yorks. Subsequently it had Hastings aircraft and took part in many reinforcement operations, among them Korea, Kenya and Cyprus. More recently it made special flights to Moscow, and to Christmas Island in connection with "Operation Grapple."

New F.O.A.C.

FROM March 1 next year Rear Admiral R. M. Smeeton, who was until June 6 director of plans at Admiralty, is to be Flag Officer Aircraft Carriers in succession to Vice-Admiral C. L. G. Evans.

Rear Admiral Smeeton has spent much of his 33 years' service in Naval aviation duties, as pilot and squadron commander and in executive positions. His first squadron was No. 800, when he flew Nimrods in 1936, and he later came to command it in 1940 in *Ark Royal*. At the start of the last war he was with No. 804 Sqn., and he later served (from mid-1941 onwards) as senior Naval representative on the British Air Commission in Washington. Later in the war he was on the staff first of Admiral Nimitz and then of Admiral Vian in the Pacific. Admiral Smeeton's post-war appointments have included those of Commander (Air) in *Theseus*, Commander (Air) and Executive Officer at Lee-on-Solent, Deputy-Director of Air Warfare (Materials) at Admiralty, and command of R.N.A.S. Halfar in Malta and of *Albion* (from June 1956 to 1958).

No new appointment has yet been announced for Vice-Admiral Evans, who succeeded Vice-Admiral A. N. C. Bingley as F.O.A.C. in January this year.

Winged Coachman

AIRCRAFT of seven R.A.F. squadrons, and six Whirlwinds from the Joint Experimental Helicopter Unit, took part in "Winged Coachman" in Northern Ireland last week. This was the Army's third air mobility trial this year, and it combined experiments tried in Black Gnat (when Pioneers were used) with those of Red Banner although supplies were on a more austere scale. The squadrons were Nos. 47 and 53 (Beverleys), Nos. 24, 36 and 114 (Hastings), No. 230 (Pioneers) and No. 74, whose Hunters simulated ground attacks. Lessons learnt in this year's trials are being put into effect in a bigger and longer-distance exercise in North Africa next spring.

Early-warner Approval

ON November 27, only fifteen months after the first flight of the prototype, the Fairey Gannet AEW.3 was given C.A. (Controller of Aircraft) release by the Ministry of Aviation. This release, roughly the military equivalent of a civil C. of A., means that the aircraft with its early-warning radar equipment is now ready to join R.N. carrier- and shore-based operational squadrons.

IN BRIEF

Cranwell beat Sandhurst by 6pt to 5 on November 30 in the annual rugby union fixture between the two colleges.

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A grant of £2,400 has been made by Nuffield Trust to R.A.F. Gaydon, Warwickshire, for the purpose of building a hobbies centre.

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The R.A.F. Benevolent Fund spent £360,653 in Britain and overseas during the first nine months of this year, making 11,158 awards.

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The cost of H.M.S. *Hermes* was given by the Civil Lord of the Admiralty, Mr. Ian Orr-Ewing, in Parliament recently as "approximately £18m." He said that the cost of oil fuel and other stores, under ordinary circumstances, would be about £8,000 a week; pay and allowances, when the carrier had her full complement, would total about £20,000 a week.

* * *

As the result of an appeal organized by R.A.F. Tangmere, which was formerly a fighter station and is now in Signals Command, the 850-year-old church of St. Andrew in Tangmere village now has a new organ which has been bought at a cost of £700 and is being dedicated next Monday by the Bishop of Chichester. Members of all squadrons which have ever served at Tangmere have contributed to the appeal.

A first book by A. Cdre P. G. Wykeham, who on January 1 next year assumes the post of A.O.C. No. 38 Group with the acting rank of air vice-marshal, is being published next February. Entitled *Fighter Command*, it is a study of the air defence of Great Britain from the Zeppelin raids in 1916 to today's SAGW systems.

* * *

W/C. F. G. Woolley, who lost his life in a Canberra accident at Strubby on November 28, piloted one of the six Vampires which in 1948 made the first Atlantic crossing by turbojet aircraft. He won the D.F.C. in 1941 for landing his aircraft in enemy territory to pick up the crew of a crashed machine and gained a bar to it four years later. He also held the A.F.C. and a King's Commendation for Valuable Service in the Air.

* * *

It is proposed to form a Specialist Navigation Association and an inaugural dinner is to be held in July next year to coincide with the graduation of No. 18 Specialist Navigation Course. The Association will be open to all graduates of the course since its inception, and those interested should write to W/C. H. L. Lewis, O.C. Specialist Navigation Course, R.A.F. Flying College, Manby, Louth, Lincolnshire.

H.M.S. "Victorious," with her aircraft marshalled on the flight deck, steaming into Malta recently for replenishment before proceeding via Gibraltar for the U.K. and Christmas leave for her crew